THE
RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer · TRANSPORT · The Railway News
The Railway Times · Herapath's Railway Journal ESTABLISHED 1835 · RAILWAY RECORD.
RAILWAYS ILLUSTRATED · THE RAILWAY OFFICIAL GAZETTE

PUBLISHED EVERY FRIDAY
AT
33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1

Telegraphic Address: "TRAZETTE PARL., LONDON"
Telephone No.: VICTORIA 8836 (6 lines)

Annual subscription payable in advance and postage free:
British Isles and Abroad.....£2 5s. 0d.
Single Copies.....One Shilling
Registered at the General Post Office, London, as a Newspaper

VOL. 62. No. 14. FRIDAY, APRIL 5, 1935

CONTENTS

	PAGE
Editorials	629
Letters to the Editor	634
Publications Received	635
The Scrap Heap	636
Overseas Railway Affairs	637
Impressions of Overseas Transport	639
Permanent Way in Victoria	640
Train Describer with Printed Record	642
Wellington (New Zealand) Stations	643
American High-Speed Streamlined Steam Locomotive	644
New High-Pressure 2-4-2 Superheated Tank Locomotives	645
Improvements at Doncaster Works, L.N.E.R.	646
New Belgian Pacific Locomotives	650
Railway News Section	651
Personal	651
Camping Coaches on the British Railways	653
Notes and News	659
Contracts and Tenders	662
Official Notices	663
Railway Share Market	664

ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

The Effects of Planning and Rationalisation

IN the stifling atmosphere engendered by the modern tendency to restrict everything and limit the freedom of the individual, the lecture by Mr. W. L. Hichens to the Railway Students' Association on March 21, entitled "Is the Pedestal on which Competition has been Enthroned Tottering?" was like a cooling breeze. Mr. Hichens showed how the immense developments of the past century have been nurtured on the freedom of the individual and how the present tendency to "planning" on the Bolshevik or Fascist systems was alien to the British constitution. In view of these sentiments, it is curious that Mr. Hichens should seem to favour rationalisation, the object of which, he said, was "to cheapen costs and to reduce the field of productive capacity." Its effectiveness in the latter direction he illustrated graphically by the statement that 137 shipbuilding berths with an annual capacity of 1,000,000 tons have been permanently closed. The other objective of rationalisation—the cheapening of costs by means of improved mechanical devices—has, of course, been largely responsible for the reduction in the need for labour, demonstrated by the increasing seriousness of the unemployment problem, and the consequently growing disparity between total prices and total purchasing power, a symptom of which is the intensification of salesmanship. In considering industrial organisation, and in suggestions for further rationalisation or planning, the objective for which industry exists should be defined and kept in mind.

* * * *

Railway Returns for 1934

Although the improved passenger and freight traffics of 1934 were contributed to by extended services and other facilities, receipts outstripped the necessarily growing expenditure, so that the ratio between the two became more favourable. A preliminary statement of British railway returns for the past year published by the Ministry of Transport shows that expenses amounted to 81·5 per cent. of total receipts, compared with 82·28 per cent. in 1933 and 83·68 per cent. in 1932. An advance from £67,436,000 to £68,700,000, or 1·86 per cent., in the total value of traffic by passenger train, was accompanied by an increase of engine mileage on this service of 3·25 per cent. Goods traffic, however, totalled £85,400,000, rising by £4,602,000, or 5·69 per cent., but the mileage of freight engines was up by only 5·30 per cent. The total train mileage of locomotives was therefore 8·55 per cent. higher. Under the heading "other miles," in which are comprised those run light, in assisting other engines, and on departmental duties, an advance of 5·75 per cent. was recorded. Locomotive running expenses, however, rose by only 2·46 per cent. Capital expenditure was £61,900,000 above capital receipts, compared with £58,155,000 in 1933, but the net revenue for the year was £32,200,000, against £29,589,000. Net receipts for railway working increased from £26,520,000 to £28,800,000 and total expenditure from £123,123,000 to £126,800,000.

* * * *

The Week's Traffics

The declines shown in the passenger receipts of the four group companies are largely accounted for by the fact that comparison is made with the week before Easter last year. For the first quarter of the year this traffic is now £389,000 behind the 1934 figures. Compared with the corresponding period of 1933, however, the week's passenger totals are better by £11,000 on the L.M.S.R., by £8,000 on the L.N.E.R., by £5,000 on the Southern Railway, but down by £2,000 on the G.W.R. Goods train receipts show an advance of £164,000 on 1933.

	13th Week				Year to date.	
	Pass., &c.	Goods, &c.	Coal, &c.	Total.	Inc. or dec.	
	£	£	£	£	£	%
L.M.S.R.	− 211,000	+ 72,000	+ 2,000	− 137,000	− 217,000	− 1·52
L.N.E.R.	− 111,000	+ 36,000	+ 16,000	− 59,000	− 249,000	− 2·34
G.W.R.	− 93,000	+ 27,000	− 3,000	− 69,000	− 103,000	− 1·77
S.R.	− 124,000	+ 8,500	+ 1,500	− 114,000	− 159,000	− 3·59

The Great Southern and Great Northern (Ireland) Railways have aggregate increases of £38,902 and £9,300 respectively for the thirteen weeks.

* * * *

Possibilities of Spring Traffic

The April issue of *Quota News*, the journal of the L.M.S.R. Commercial Department, points out some encouraging implications of the Spring timetables. In the first place, the fact that the demand for augmented services begins to be felt in May is proof that railway advocacy of early holidays has not passed unheeded. Such easing of the peak period by spreading traffic over two additional months not only benefits the companies, but contributes to the comfort and convenience of travellers. The L.M.S.R. has increased its facilities compared with

1934 in consequence of indications from last year's business that purchasing power is higher, and readers of *Quota News* will not be slow to seize the opportunities offered by a public with more money to spend and better facilities to spend it on. Recognising that the sale of railway service is by no means the prerogative of the Commercial Department, *Quota News* is therefore extending its circulation to reach every member of the staff who comes into contact with the travelling public, in the confidence that employees of every grade will exercise their undoubted ability to promote traffic by timely advice, assistance and suggestions. Already improved business is apparent, for in January only three out of fifteen districts failed to better their passenger results of last year, and seven exceeded the quota.

* * * *

Mr. H. F. Clayton

In our Personal columns this week we record the death of a remarkable man of many parts, Mr. H. F. Clayton. A drysalter by trade, he was known to railwaymen as the manufacturer of the Clayton fog-signalling machine. This machine was originally the idea of a man named Dixon, but it was Mr. Clayton who developed it and established works at Penistone for the manufacture of the apparatus and the detonators. The machine held some 20 detonators, which the fogman put on the rail by means of a lever at the side of the line. When the signal was put to "clear," he moved the lever into mid-position and thus removed the detonator from the rail until the train had passed. If the signal remained "on," so did the detonator on the rail, where it was exploded by the train, after which a full movement of the lever threw out the spent detonator and a new one was grasped and held by a clip actuated by the lever ready for future use. The Cudworth collision of January 19, 1905, showed the objections to a signalman having to leave his signal-box in order to place detonators on the rails, as he had to do, in accordance with rule, in the absence of fog-signalmen, and Mr. Clayton invented the arrangement now known as the detonator placer, whereby this was done by a lever in the locking frame. As well as founding Karrier Motors Limited, Mr. Clayton was a well known racehorse owner, his *Disarmament* winning the Cambridgeshire in record time in 1931.

* * * *

Early Days in Germany

An article in *Die Reichsbahn* shows in a striking manner the difficulties placed in the way of railway promoting in Germany in the early days by the existence of so many duchies, grand duchies, principalities, and other territorial divisions down to the founding of the Empire in 1871. At one time these states had their own Customs, but the establishment of the Zollverein in 1834 (to which we referred editorially in our issue of March 9, 1934) removed this hindrance to internal trade. The country around Frankfort-on-Main, then a free city, presented an extraordinary complication of frontiers. Frankfort had hoped to regain its old trade ascendency, diminished by its opposition to Prussian Customs policy, by becoming the centre of important railway lines. Their construction was particularly slow on account of political conditions, in which the disagreements among royal and ducal families played a great part. The first line from Frankfort to Wiesbaden passed through three states, and the discussions over it lasted as many years. This was, however, expeditious work compared with that involved by the short Frankfort-Homburg line. Fourteen years of conversation elapsed and still one principality, Hesse, would not agree. The line was at last made to pass outside it; Hesse was afraid that a railway to Homburg would enable that town to harm the business of its own spa, Bad Nauheim. Even after 1871 some difficulties remained. For years all passenger trains had to stop at Offenbach in consequence of an agreement made in 1868 between Prussia and Hesse, and expresses from Frankfort to Hanau had to be routed another way.

* * * *

A Point in Look-Out Protection

A trifling accident—an injury to a permanent way man's ankle—led to Mr. J. L. M. Moore, as recorded in the accident reports for the three months ended June 30, 1934, inquiring how it came about that an express passenger train travelling at 60 m.p.h. approached unnoticed to within 300 yd. of the look-out man protecting a gang of 30 men engaged in relaying. The scene of the incident was on a four-track main line which runs in a deep cutting and is curved. Reading from the west the roads are: down main, up main, down goods, up goods; the goods lines are on the inside of the curve. The work was being done on the down main line. A long goods train on the down goods line shortened to a great extent the look-out man's view of the up main line, and it was this disability that gave him such short notice of the approach of the express. Mr. Moore said it was fortunate that a more serious accident did not result from a grave error of judgment on the part of the ganger, who failed to give proper consideration to the curvature of the line and the position of certain overbridges. The look-out man was considered also to blame, as it was his duty to draw the ganger's attention to his inability to obtain sufficient view of trains under certain circumstances.

* * * *

The U.S.A. in a Corner

A sorry picture of conditions in the United States was painted by Mr. Milton W. Harrison, President of the Security Owners' Association of New York, when he addressed the Minneapolis Traffic Club recently. "A combination of the influence of depression, rigid regulatory policy, labour domination and unregulated competition has resulted in the collapse of railroad credit," Mr. Harrison declared. "Government ownership is thus more likely to arrive by the back door instead of the front, without any real sentiment in favour of such a policy having been shown by the public. The Interstate Commerce Commission and Congress exercise power of economic life or death over the railroads. Yet at the same time they accept no responsibility whatever toward investors for the financial results that may flow from their acts." As an example of the production of effects contrary to intentions, Mr. Harrison cited the reduction of the railway labour forces from 1,822,000 in 1926 to 990,000 in 1934 owing to measures undertaken ostensibly to provide more employment for railway workers. Such measures, forced upon the railways, necessitate concentration upon the development of improved operating efficiency and the consequent reduction of man-power per unit of output. The last state is thus worse than the first. It almost looks as if the U.S.A. would soon be driven by circumstances to face squarely the fact that the progressive replacement of men by machines, and the consequent reduction in incomes, calls for the issue of incomes from an entirely new source. Only so can effective demand be increased commensurately with increasing output.

* * * *

A Collision under Colour-Light Signals

It was a great relief to find, on inquiry, that the stop-and-proceed rule did not contribute to the collision of

August 6 last at Poppleton Junction, York. That rule, as to which there is some discussion just now, figured in the other collisions at the same place on August 27 and September 10, 1933, and at Alne, 11 miles farther north, on the following December 6, as well as, earlier, at Three Bridges on January 28. The accident, a summary of the report on which appears on page 656, was a collision between two expresses from the North. Three consecutive signals were concerned. Signal U.3, which may be considered as the up outer home, is agreed to have been at " yellow " when the driver of the second train passed it. An automatic signal, U.2, 1,264 yd. nearer York, should have been at " red " in order to protect the first train, the tail of which was 961 yd. farther on; then came U.1, 270 yd. in advance of the tail of the first train, which had just been changed from " red " to " yellow " to allow it to proceed after the stop. The driver of the following train claimed, however, that U.2 was at " yellow," but it is suggested that a greater brilliance of the " yellow " in U.1 than the " red " in U.2 made the former seem to be the nearer to the driver. Colonel Woodhouse observes that the man, having evidently mentally registered what he took to be the indications of the next two signals, relaxed his attention, and not only overlooked the " red " in U.2, but failed to see the tail-light of the first train until too late to stop clear of it. The inadequacy of the tail-lamps used on British railways is again suggested in this accident.

* * * *

Accidents on the Reichsbahn

The German State Railway enjoys a deservedly high record in the matter of safety, to which the careful observance of rules, the use of excellent signalling arrangements and other factors contribute. During last year the number of accidents unfortunately increased by 10 per cent. over 1933 but still remained below the levels of 1930 and 1931. Among the total of 2,194 there were 255 derailments and 205 collisions, in which 18 passengers were killed. Total passenger train kilometres were 442 million (276,250,000 train miles). Much the worst accident, from the operating point of view, was a collision on a single line near Stuttgart on December 22, in which, according to *Die Reichsbahn*, 9 persons were killed and 36 injured. At Langwedel a fast train was derailed through excessive speed over branch line points, with 3 killed and 9 injured. At Pforzheim a shunting engine fouled a running line as a train was coming in, resulting in 7 killed and 94 injured. A collision at Halle killed 2 and injured 209, but half were minor casualties. Near Mannheim a signal was passed at " danger " in a fog and a collision resulted, with 57 injured. The number of level crossing accidents has again increased by 22 per cent. over 1933. Of these 82 per cent. are attributable to the carelessness of road vehicle drivers and 18 per cent. to irregular operation of the barriers by the railway watchmen.

* * * *

Preventing Rail Creep

There are several methods by which rail creep can be minimised, if not indeed altogether prevented. The most effective is, of course, to ensure a thoroughly suitable road-bed by means of adequate drainage and ballast, and on this road-bed to ensure that the sleepers carrying the rails shall be firmly packed so as to avoid vertical movement under the weight of trains. In addition, of course, the fastenings of the rails to the chairs or soleplates, and of these to the sleepers should not be allowed to become loose. It is not always possible to achieve this counsel of perfection, especially on old formations which may not be always dry and the drainage of which cannot be undertaken immediately. It is in such circumstances that the use of special devices to prevent rail creep is most advisable; and often even where the track is as stable and well maintained as it is possible to have it, there may be a tendency to creep. Various types of rail anchor fixed to the rail and abutting upon the sleepers are in use, and, with bull-headed rails, the use of certain types of steel keys has also been found effective in minimising creep.

* * * *

The 4-4-4 Wheel Arrangement and Speed

On pages 200 and 201 of THE RAILWAY GAZETTE of February 1 we described the new 4-4-4 lightweight high-speed locomotive of the Baltimore & Ohio Railroad. This wheel arrangement would appear to be a favourite one with the designers of streamlined super-speed express engines. In Germany as well as in America plans have been prepared for the construction of such locomotives, and the one illustrated and described on page 644 of this issue is claimed by the Lima Locomotive Works to offer a straightforward combination of established basic features with important innovations in detailed development. As in the B. & O. example, coupled wheels of 7 ft. 0 in. dia. are used, but the two outside cylinders, in this case 21½ in. by 26 in. arranged for a 60 per cent. maximum cut-off, drive the leading coupled wheels. The cylinders and boiler are proportioned for a sustained horsepower output of 2,200 at all operating speeds over 30 m.p.h., and Mr. W. E. Woodard, the Lima Works Vice-President, says that this, at a conservative estimate, will serve for hauling a train of 250 tons at a sustained speed of 90 m.p.h. on straight level track. The locomotive is balanced for a safe operating speed of 100 m.p.h. and is streamlined to a point consistent with accessibility of mechanical parts. The adhesion weight of 58 tons is in remarkable comparison with that of the B. & O. example, 44½ tons. A booster capable of working up to 18 or 20 m.p.h. is used for smooth starting and quick acceleration.

* * * *

Stresses in Aluminium Locomotive Rods

An interesting paper on stress distribution in aluminium connecting rods was presented by Mr. R. L. Templin at a recent meeting of the Railroad Division of the American Society of Mechanical Engineers. He said that limitations of space in the main driving wheels of large freight locomotives frequently preclude the provision of the desired value of counterbalance weight when using the ordinary types of steel rods, and it therefore seems that considerable advantages would accrue if lighter rods could be used on such engines. With lighter rods and counterbalances, the out-of-plane forces would also be diminished. Aluminium alloy rods have been used for some considerable time past on locomotives of the Alton & Southern RR., and test data have shown that in an engine working at about 80 per cent. of its rated tractive force, the maximum measured stress in the shank portion of the connecting rods was 7,900 lb. per sq. in. The stresses in these rods were, however, fairly uniform over the entire cross section. One test indicated a slight tendency on the part of the rod to bend toward the outside. The maximum measured stress in the shank portion of the rear intermediate rods of a 0-10-0 locomotive was 6,800 lb. per sq. in., and this was when the engine was working at 90 per cent. of its rated tractive force. The stress on the inside faces of the same rods was about 50 per cent. higher than the stresses on the upper and lower edges of the rods, which indicated that the bending stresses were developed in the vertical plane of the rod.

XUM

Indian Railways in Parliament

IT is not often that the House of Commons sees fit to devote so much time to debate upon a railway subject as it did on Monday. One reason for this is summarised in the first few words of a reply by the Secretary of State for India. He said that the railway system of India was one of the three great systems of the world, and it was essential that they should set up the most efficient, independent Railway Board which it was in their power to initiate. The debate was also opened by Sir Samuel Hoare, who moved a manuscript amendment to add a subsection to clause 175 of the Government of India Bill, dealing with the executive authority to be exercised by the Federal Railway Authority. This new subsection definitely places the responsibility for safety on Indian railways upon the Federal Government, independent of the authority managing any railway administration. He moved this amendment on the grounds that, just as the Government in this country is responsible through the Board of Trade (presumably this was a slip for Ministry of Transport) for safety on British lines, questions of safety on Indian railways ought to be taken out of the control of those interested in operation upon business lines and responsible for a good return upon railway capital. The amendment appears to have been called for, as the Princes had taken the view that the clause, as drafted, was ambiguous and should be clarified as in the amendment, which was agreed to in the House.

Clause 176 dealing with the composition and powers of the Railway Authority, was as expected, contested on the one hand by the Labour Party, which wanted all the members of the Authority to be nominated by the Indian Government, instead of three out of the seven being nominated by the Governor-General as provided for in the Bill. The Conservative element, on the other hand, was strongly in favour of leaving, as far as possible, nothing to chance to insure that Indian railway administration should not fall under political or communal influences. In this connection Sir H. Page Croft pointed out that the 40,000-mile railway system of India, with its £600,000,000 capital, had been built up largely with British investors' money, and, as the trustee for many trusts, he was anxious to see everything possible done to maintain the credit of the Indian Empire. For this reason he advocated the nomination of four-sevenths of the members of the Railway Authority by the Governor General, at any rate at first. An important point was also made by Mr. Raikes when he said that the mobility of the army depended upon the railway service, and it was vital that, if there was to be loyalty in future times of emergency, the Railway Board should be such as to hold the staffs together in the cause of discipline and order. The Board should therefore be outside party politics and command the confidence of the workers—an all-important issue not previously raised in the debates. Sir Samuel Hoare, in reply, pointed out that as members of the Authority would have security of tenure and were bound down by conditions, he did not think members nominated by the Federal Ministry were going to act differently from those nominated by the Governor General. The appointment of the Chief Commissioner of Railways by the Governor General at his discretion,* added a very powerful deterrent from any tendency towards unpractical and unreasonable measures, if proposed by the majority of the Authority. The broad policy as to the percentage of the various sections of the population employed by the railways would also be laid down and would be alterable only with the consent of the Governor General. He thought therefore that the position was as safe as it could be. It is significant, however, that clause 187, dealing with disputes between rival railway interests in India, is to be superseded by one of wider scope, which envisages a tribunal to deal with differences between railways, whether owned by the Princes or in British India, instead of only those in the former category.

An amendment to clause 177 was moved by Mr. H. Williams, in the form of the following new proviso to be added:—

> Subject to the provisions of this sub-section it shall be the duty of the Authority, so far as it may be reasonable, to ensure that plant, goods and material for the service of the railways shall have been produced within the British Empire, and under conditions of labour which are fair, having regard to all the circumstances.

In favour of this amendment it was argued that this country had for years conferred distinct advantages on Indian commerce, and it was therefore reasonable that the new Government should give prior consideration to British producers of railway material. To this the Secretary of State's rejoinder was that for many years past the Government of India had been allowed to place orders for Indian railway material where it chose, and as a result 75 per cent. had been ordered within the British Empire and 25 per cent. outside it. It would therefore be a mistake to go back on this policy and dictate a new one by statute. Mr. Churchill foresaw that, as 25 per cent. of the orders had gone abroad when there was said to be goodwill between India and the United Kingdom, these orders would, in future, when relations were less happy, be used as counters of economic and political warfare. Though tariffs could be terribly effective, the placing of orders might be hardly less so. He believed that invidious and unreasonable pressure would be exerted on the higher authorities and that the Bill was placing in the hands of those who wished to use it, a weapon of irritation, retaliation and pinpricks against British trade and the British people. No other country in the world, he asserted, would, in similar circumstances, have failed to ensure preference for Imperial goods, and when the power that claimed this consideration was the protecting power on land and sea, it had all the more right to press this claim. To this Sir Samuel Hoare replied by surmising that the amendment would tend to cause suspicion and irritation in India and that—so vaguely was it worded—it would certainly react in all orders being given to Indian firms alone, to the detriment of British trade. Although the amendment was negatived, it would seem that the inference of the Secretary of State's final surmise was perhaps a little misleading. For, at the present time, and for some time past, it has been the policy in India to order most things that can equally well be made in or supplied by India, from Indian firms, and it is now only locomotives, wheels and axles, machinery and other materials which have to be imported, that go to British or foreign firms. On the whole, the debate took the expected course, and calls for little comment beyond that already made upon the original proposals for a Railway Authority, in our editorial on pages 774-775 in THE RAILWAY GAZETTE of November 24, 1933. With regard to the purchase of railway material, however, it is very regrettable that, in view of the vast amount of British capital sunk in Indian railways, and of India's obligations to Great Britain in respect of defence and other assistance, some means could not have been devised to ensure that British trade should receive preferential treatment—as should also be insisted upon when foreign loans are floated in this country. Moreover, as it is ultimately dependent upon the success or failure of the reforms as a whole, we must admit to grave misgivings with regard to the future administration of Indian railways.

* This is not quite correct as the Chief Commissioner will be appointed by the Authority, subject to the confirmation of the Governor General.

Speeding Up

CONSIDERABLE interest centres in the announcement by the London & North Eastern Railway of the introduction, in October next, of the first streamlined steam-hauled super-speed express train to run on British metals. The experimental journeys from King's Cross to Newcastle and back on March 5 last amply proved the practicability of such a schedule as four hours in each direction between Thames and Tyne. Without special preparation of either locomotive or stock, and notwithstanding easy running over various stages of the journey, to avoid getting too far ahead of time, a net gain was achieved of 10 min. on this schedule going down, and 12½ min. coming up. But with the new service, appropriately to be named Silver Jubilee, the use of specially-designed rolling stock, as fully streamlined as possible, will give so much greater margin that it will be found practicable to include a stop at Darlington in the four-hour timing, so that Teesside will benefit equally with Tyneside. The starting-time from Newcastle is to be 10 a.m., allowing the business man time for a brief visit to his office before departure; and the return is to be from King's Cross at 5.30 p.m., which the existing 5.30 p.m. express has made so popular with north-bound travellers. A seating capacity of 194, both first and third-class, with full restaurant car accommodation, will be provided, in articulated stock, and, as is both reasonable and desirable when such exceptional facilities are provided, a small supplementary charge will be made.

It is significant, as was pointed out in the discussion following the reading, before the Institution of Locomotive Engineers (as reported on page 622 of our March 29 issue), of Mr. E. W. Selby's paper on "Speeding-up of Train Services," that two papers on speed possibilities with steam, and the necessary equipment for their realisation should thus so rapidly have succeeded one another. The other paper, entitled "High Speed and the Steam Locomotive," was fully reported in our March 1 issue. It is of even greater significance that the reading of this second paper should practically coincide with the announcement of the forthcoming L.N.E.R. high-speed London-Newcastle service. This L.N.E.R. enterprise is in itself the answer to the stereotyped claims—advanced in the discussion on Mr. Selby's paper—that already we travel quite fast enough, that the present craze for speed may prove to be but a flash in the pan, and that higher speeds will involve considerable risk. As to risk, a conclusive answer is provided by railway accident statistics, which show that for nearly thirty years past there has been no serious accident in this country to any of the fastest British trains, or any mishap for which mere speed could be held responsible. As to the demand, the patronage invariably extended to new railway speed ventures provides an adequate answer; and the reason, with little doubt, is that the public feels that on the railway speed may be enjoyed in conditions of safety and comfort offered by no other mode of transport.

Certain other points concerning British express train services were stressed in the discussion just referred to. One was that, as a condition precedent to the introduction of high speed rail services, general acceleration of service was desirable, and especially, as has so often been laboured in these columns, a levelling up of main line speeds to the best existing standards, which would in itself facilitate the introduction of super-speed trains. The complaint in the discussion that the large number of existing locomotives of earlier classes, of which economy compels the continued use, would make any further acceleration difficult, was more than answered by the fact that many older types of engine—the L.N.E.R. Ivatt Atlantics and the Southern 4-6-0 "King Arthurs" were given as specific examples—were today performing feats of haulage that might well have been regarded as impossible at the time of their construction. With many existing locomotive types, indeed, it is possible that their capacity for speed as yet has been far from fully exploited. A third consideration on which stress was rightly laid was that of punctuality, both as a condition making for safety in operation, and as a debt to the passenger. Indeed, with such services as the projected London-Newcastle 4-hr. high speed service, strict punctuality will be a *sine qua non*, and the passenger will have some reason for demanding the refund of his supplementary fare, which he has paid for the additional speed, if the train does not arrive to time.

A final and a valuable suggestion that was made in the discussion on this paper was that every year each British railway should have something definite to show in the matter of service acceleration. A summary of the total number of "minutes gained," which turns out in the end to include various trains which have been put on to summer non-stop workings, and which do not figure in a list of "minutes lost" when they revert to their winter workings again, or which includes large amounts of time based on improvement of connections rather than acceleration of running, is merely throwing dust in the eyes of the public. One single wave of acceleration, such as took place in 1932, followed by a period of almost unbroken tranquillity, or even, on some routes, an ebb tide in the matter of speed, cannot also be regarded as an ideal way of dealing with the matter. But a constant process of improvement, applied not merely to the main lines over which spectacular speed achievements can be staged, but also to the cross-country services which, in many cases, are substantially in need of acceleration, would convince the public that the railways, so far as their resources permit, are constantly endeavouring to give quicker and better service. Safety, celerity and comfort of passenger service are railway trump cards; if these can be coupled with the certainty of a punctual arrival the railways will hold a very strong hand.

* * * *

Canadian National Railways

THE annual report of the Canadian National Railways for 1934, tabled in the Canadian House of Commons, Ottawa, on Tuesday last, covers the first year of operation under the Board of Trustees. During that period the general but slow improvement in trade conditions has resulted in the gross operating revenues of the system increasing by $16,382,759, from $148,519,742 in 1933 to $164,902,501, or 11 per cent. This increase, although it falls short of the average revenues for the ten years 1923-32 by $91,000,000, compares favourably with that of the Class 1 systems of the United States the average increase in gross revenues of 1935 on 1934 of which amounts to only 5·7 per cent. Passenger revenue showed an increase of 8·6 per cent., in spite of a reduction in the passenger train mileage. Indicative of the low cost of travel, due to extensive reduced fare facilities, is the fact that the average fare during 1934 was 2¼ cents a mile. Freight receipts also showed an increase over those of 1933 of 12·3 per cent., tonnage having increased in every region and in every major group of commodities. The average freight train operated during 1934 was 1,535 as against 1,512 gross tons in 1933. Substantial measures of relief for distressed areas were provided in the form of rate concessions. For the first time since consolidation in

1923 the C.N.R. hotels have produced an operating surplus, an increase of $213,600 in the net income providing a figure of $37,017 under this head. Consequent upon these increases in receipts, the operating expenses rose by $9,123,519, from $142,812,559 in 1933 to $151,936,078, or 6·39 per cent. This improves the operating ratio from 96·16 per cent. to 92·14 per cent. The increases under specific heads were, maintenance of permanent way and structures, 10·41 per cent.; maintenance of equipment, 6·42 per cent.; transport expenses, 6·15 per cent. Traffic canvassing expenses however, were reduced by 4·38 per cent. The report states that the increase in net operating revenue of $7,259,240, from $5,707,183 in 1933 to $12,966,423 or 44·3 per cent. of the increase in gross revenue, may be considered satisfactory. Evidence of the measures instituted to combat the depression is to be noticed in the fact that the net revenue for 1934 was $11,774,256 better than that of 1931, although gross revenues were $35,602,661 less.

A number of important pooling and co-ordinating schemes with the Canadian Pacific Railway were effected during the year, and a summary of the more notable of these appeared on page 593 of THE RAILWAY GAZETTE last week. These mutual agreements will involve, when the sanction of the Board of Railway Commissioners has been obtained, the abandonment of 538 miles of redundant lines of which 296 miles are Canadian National, and 242 miles Canadian Pacific. The report gives considerable attention to the problems of co-ordination and points out that such arrangements are not always as economically desirable as a superficial survey would suggest. Difficulties both legal and economic are also mentioned in connection with proposals for the consolidation of telegraph and express departments. In addition to proposals for abandonment made with the C.P.R., the C.N.R., has applied to the Board of Railway Commissioners for leave to abandon 24 lengths of railway involving 547 miles of line.

LETTERS TO THE EDITOR

(*The Editor is not responsible for the opinions of correspondents*)

New Pattern of Ground Signal

London, March 31, 1935

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In the article on page 611 of your issue for March 29, it is stated that " this indication of improperly thrown points is new to railway signalling." This is not so. Saxby & Farmer's old point indicator used in India, for example, provided such an indication, and so did several designs of continental indicator, such as the precision cam movement of the Bruchsal works.

Yours faithfully,
" POINT DETECTOR "

High Speed Steadiness—A Theory

102, Brougham Street, Hartlepool.
March 25

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In your issue of March 22 there appears a letter from Mr. Dendy Marshall in which he explains two effects which he considers to be conducive to steady running at high speeds. I am afraid that the first reason cannot be accepted, as it is based on a misconception of the problem. If it was correct then we should expect a progressive diminution of the shocks felt in the coach, as the speed increased. This is not so, as a marked reduction takes place during a comparatively small increase of speed past the critical point.

The misconception is shown by the explanation being based on the resultant instantaneous accelerative forces and velocities acting on the coach body relative to the stationary track; whereas the subject is concerned with the magnitude of the shocks felt, and therefore the forces acting, between the coach and its contents—*i.e.*, between the seat and the passenger. Therefore we must consider those changes of velocity of the seat which cause a sudden accelerative force to be applied to the passenger's person, as it is only under such conditions that a shock will be felt. It is obvious that at a steady speed no such force will result from the forward motion of the coach as both seat and passenger have a uniform velocity, and this will apply at any constant speed from zero upwards. Now any transverse movement of the coach body will give rise to an accelerative force between the seat and the passenger, which force will act at right angles to the longitudinal axis of the body when at constant speed, and a shock will be felt. The bulk of high speed running falls within a practical definition of constant speed as the rates of change of velocity are quite small, and especially so when compared with the rates of acceleration produced by transverse or vertical shocks. Therefore, steadier running can result only from a reduction in the latter rates of acceleration, which in its turn implies a reduction in the magnitude of forces transmitted to and causing movement of the body. This is the vital point which is not brought forward by Mr. Dendy Marshall.

The second explanation seems likely to have more bearing on the problem, but it is necessary first to consider the weights and speeds of the vehicles that have been considered in this correspondence. The modern coach tares 33 to 35 tons, whilst the 6-wheelers instanced by Mr. Macdonald would be probably 14-15 tons. In both cases the critical speeds appear to be found above 70 m.p.h., and the two are not widely separated. The 4-wheeled tram car, a little over half the weight of the 6-wheeler, achieved very steady running at approximately half the latter's speed; and this despite the relatively greater instability of the sleepered tram track. These results seem too inconsistent to be wholly explained by the track deflection theory, though this will have some influence at the very high speeds.

Apart from my previously expressed opinion, I can see no other solution at present, unless the action of a wheeled truck in travelling along rails undergoes some change above a certain speed. There does not appear to be any evidence to support this. A practical investigation of the problem would doubtless include the recording of the shocks and deflections transmitted to the wheels and bogie frame at various speeds; methods of doing this being already in use.

Yours faithfully,
H. BELL

NEW L.M.S.R. STEAMER FOR BELFAST SERVICE.—The passenger, cargo, and livestock carrying steamer *Duke of York*, is now being fitted out by Harland & Wolff Limited, Belfast, for the Heysham-Belfast service of the London Midland & Scottish Railway following her launch a month ago by the Duchess of Abercorn. The principal dimensions of the ship are: overall length, 349 ft.; breadth (moulded), 52 ft.; depth (moulded), 19 ft. 6 in.; speed, 21 knots. A special feature of the saloon accommodation is the absence of any superimposed berths. Restaurants, smoke rooms and lounges will be provided for both first- and third-class passengers. The *Duke of York* will be equipped with mechanical stokers. The Grinnell automatic sprinkler and fire alarm system is being fitted throughout the passenger accommodation.

PUBLICATIONS RECEIVED

Handbook of Information and Indexed List of British Standard Specifications (Cd. 5050), 1935. London: British Standards Institution, 28, Victoria Street, S.W.1. 8½ in. × 5½ in. 90 pp. 1s. 2d. post free. —The B.S.I. has issued its half-yearly handbook which includes the indexed list of current British Standard specifications to January 1, 1935. Special reports on standardisation in the chemical and building industries, and industrial standardisation as viewed by the Imperial Economic Conference, are followed by sections giving the current list of B.S. specifications, the new specifications recently issued, and those in course of preparation, and a complete subject index.

Railroad Mergers. By John Will Chapman. 1934. New York: Simmons-Boardman Publishing Company, Hudson Terminal Building, 30, Church Street. London: Simpkin Marshall Limited, Stationers' Hall Court, E.C.4. 9¼ in. × 6 in. 157 pp. Appendices, and folding and other maps. Price 15s. or $3.00.—Literature on the subject of American railroad mergers is already voluminous, but there is still plenty of room for a book of this kind, which is informative, concise, and readable. The historical introduction gives a good account of the first merger of any importance, which in 1853 formed the nucleus of the present New York Central system. In 1866 Congress passed a law allowing the connection of different roads, so that continuous lines might be formed. As larger systems were rapidly welded together with practically no restraint by Congress, rivalry in the acquisition of lines grew, accompanied by throat-cutting competition, and this was followed by rate agreements, pools, &c. These had their share in bringing about the Sherman Anti-Trust law in 1890, which forbade combinations in restraint of trade, and was supplemented by the Clayton Act of 1914. This later Act declared with reference to railroads that no corporation engaged in commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital of another corporation engaged also in commerce where the effect of such acquisition may be substantially to lessen competition—or tend to create a monopoly.

Despite all legal hindrances, however, mergers continued to multiply. In 1902 there were 204,000 miles of railroad in the United States owned by more than 2,000 corporations, but due to operating agreements and leases the number of operating companies was somewhat over 1,000. More than 80 per cent. of this mileage was grouped into nineteen great systems. Of these nineteen, eight controlled almost 70 per cent. of the total and each of these eight had mileage totalling above 10,000 miles. Notwithstanding governmental restrictions against combinations up to 1920, consolidations continued to be a dominating force in railroad activities.

Public policy in the matter of railroad mergers was, however, directly reversed by the Transportation Act of 1920 which permitted and legalised a limited number of huge consolidations subject to the authority and approval of the Interstate Commerce Commission. The rest of the book is devoted mainly to the merger problems which have arisen out of and since that Act, and the cases for and against the different merger plans are impartially set out. We are grateful to the author for giving us the full text of the more important consolidation plans. These include the original plan put forward by the Interstate Commerce Commission in December, 1929, and its revised plan of June, 1932; the four-system plan of the Eastern trunk lines proposed in October, 1931; and the report issued in February, 1933, by the National Transportation Committee; and the F.H. Prince-Barriger plan of September, 1933. Maps serve further to illustrate the four-system plan, and the 1929 plan of the Interstate Commerce Commission, and the last appendix to the book gives the text of the Emergency Railroad Transportation Act of 1933. Such important matters as holding companies and their regulation; recapture of excess earnings; valuations as a factor in rate-making; and what policy should be adopted regarding short lines and abandonments, are fully treated. There is a good bibliography.

Swiss National Tourist Office Calendar.—A companion to the calendar of the Swiss Federal Railways, which we reviewed in our issue of February 22, is that published by the Swiss National Tourist Office. Both are planned on similar lines, but the views on the ninety-six tear-off pages of the Tourist Office calendar are selected to emphasise the scenic and sporting attractions of the country, and the captions are in English. Winter sports naturally form the subject of many illustrations for the early and late months of the year, and we notice that these pastimes appear far too engrossing to allow their exponents time for those alarming demonstrations of gaiety which characterise the average alleged bathing belle (*genus Britannicum horrendissimum*). Compilers of English holiday literature please copy. There is even a picture of a swimming pool in which nobody is looking at the camera, and one of those present appears to be feeling the cold. None of the sports views suffers from that unfortunate standardisation which sometimes invades travel propaganda for this country. Among them is a worm's-eye view of an alpinist, which commands admiration by its unorthodoxy.

The examples of Swiss scenery are magnificent and artistically recorded. Admittedly, the photographers have unusually favourable material, but there is an individuality in the views which might easily have been missed. A few are of railway subjects, among which the most attractive is that of a train on the Furka-Oberalp line conveying skiers to the heights for the run down to Andermatt. A sprinkling of architectural pictures completes this well-chosen representation of Switzerland as the tourist sees it.

Holiday Literature.—"Easter Holidays" is the title of the programme of travel facilities for the approaching season published by Dean & Dawson Limited. The popularity of the rail cruise with reserved accommodation is indicated by the fact that a Blue Mediterranean Special has joined the William Tell of last year, while Spain, Italy and Hungary are now similarly served. Those unable to find time for a trip abroad, but wishing for a more varied week-end than that afforded by a visit to a single resort, will be interested in the special Easter tour to Snowdonia and North Wales. Inclusive costs, permitting third class travel to and from Carnarvon, are quoted from London and the provinces. Dean & Dawson also sends a list of cruises for 1935 and particulars of ocean travel during the winter-spring season of this year.

Easter Holidays Programme.—Thos. Cook & Son Limited sends a programme of Easter holiday arrangements at home and abroad, including cruises and special tours in Canada and the United States. Preceding the information as to fares and itineraries, there is a useful illustrated introductory section summarising the attractions of the various centres and types of holiday available. Trips to Switzerland with reserved rail accommodation and at all-in rates are again listed, with the additional facility that passengers can avail themselves of these trains for journeys to Italy. With the Easter programme come advance notices of railway tours through Germany and Italy, which have been arranged for the summer. An inclusive fare of £23 provides for a 15-day journey through Germany, with reserved seats in the train throughout. For £25, travellers will be able to enjoy a fortnight's tour of Italy, going outwards down the west coast to Naples and returning through Florence, Venice, and Milan.

Lubricity.—This is the title given to the bright little house organ of Fletcher Miller Limited, Manchester. Since the October issue appeared *Lubricity* has undergone a considerable amount of grooming, and the January number which we have before us is attractively made up in a silver board cover. In addition to articles on technical matters relating to the uses of Cooledge and Swift oils, there are also a number of bright features such as an attack on "Yes" men.

XUM

THE SCRAP HEAP

A Railway Anthology

It is easy to forget that the early days of the railway occurred in a period when newspapers were few in number and ponderous in tone. No members of the peerage were then paid to inform the public through the pages of the Sunday press how Mayfair was reacting to the new developments, and topical comment was still circulated by the ballad sheets which were hawked about the country for a few pence.

We are fortunate to have been lent an example of such a composition by Mr. John Ogg of 18, Norham Road, Oxford. Entitled "The Wonderful Effects of the Great Rail Road! or Delights and Pleasures of Travelling by Hot Water," and printed at Cheltenham, it opens with the following sentiments:—

Now of all the great wonders that ever was known,
And some wonderful things have occurred in this town,
This Great Western Rail Road will beat them all over,
And whoever first thought on't was a wonderful cove.

Apart from its delicate flattery of the directors, this verse had the advantage of being sufficiently unspecific to qualify the ballad for sale in any town to which the company might penetrate. The author then proceeded, after four more stanzas of similarly appreciative observations, to epitomise the æsthetic appeal of a train as pithily as we have ever seen it done:—

What a beautiful sight it will be for to see
A long string of carriages on the Rail Way
All loaded with Passengers inside and out
And moved by what comes from a Tea Kettle's spout.

A beautiful sight indeed! and one which the financially interested would find hardly less gratifying to the pocket than gladdening to the heart. But the author soon pricked his bubble by ending on a cynical note:—

So these are a few of the strange alterations
That this wonderful rail road will make in the nation,
And if the share-holders be not careful and mind what they're after
They may all get blown up by this boiler of hot water.

As soon as the railway became an accepted institution, its appeal to poetic fervour seems to have diminished. Provoking neither praise nor blame in any marked degree, its appearances in verse were chiefly incidental. But while the high priests of literary taste were looking backwards to the days of chivalry, there was springing up in England and America a school of writers who catered for exponents of that direful accomplishment—the drawing room recitation. These did not scorn to draw upon phases of contemporary life. "The Fireman's Wedding" is an established classic, but who today remembers "The Bridge Keeper's Story" by the same author. The plot will be readily deduced from the second verse:—

You see how the drawbridge swings open
When the vessels come in from the bay,
When the New York express comes along, sir!
That bridge must be shut right away!

The bridge keeper, it seems, was a man of big ideas, and disdained the modest but adequate competence he received from the company for his services:—

You must know that the wages I'm getting
For the work on the line are not great
So I picked up a little shoemaking
And I manage to live at that rate.

His cobbling activities encroached upon his time to such an extent that he irregularly deputed the operation of the bridge to his small son, who had the misfortune to become entangled in the machinery by an unspecified part of his attire, which we, with an eye to the dramatic, assume to have been the seat of his trousers.

Before he could be detached, the garments gave way and their owner fell into the river below, thereby setting his father an interesting problem of conduct which was expressed as follows:—

Should I leap in the swift-flowing torrent
While the train went headlong to its fate
Or stop to refasten the drawbridge
And go to his rescue too late?

A brief mental struggle between duty and paternal instincts prepared the way for the grand climax:—

Quick as thought, then I flew to the windlass
And fastened the bridge with a crash,
Then just as the train rushed across it
I leaped in the stream with a splash!

It seems superfluous to add that the child, who appears to have been unusually buoyant, was saved in the nick of time, or that the work of rescue was materially assisted by the fact that his bright golden hair allowed him to be readily distinguished from the rest of the flotsam and jetsam in the river.

Children have not always played such a dubious part in railway poetry. There is some lively description in a poem by Robert Louis Stevenson where a child gives his impressions of travel by express:—

All the sights of the hill and the plain
Fly as thick as driving rain.
And ever anon in the wink of an eye
Painted stations whistle by.

The talkative child, too, has been immortalised beyond his deserts in a poem by an anonymous Scots author which was recently quoted in *The Glasgow Herald*:—

There's a hoodie-craw on yon turnip raw
And seagulls—sax or seeven.
I'll no fa' oot o' the windae, Maw,
It's sneckit as sure as I'm leevin.
We're into the tunnel! We're a' in the dark!
But dinna be frichtit, Daddy,
We'll sune be comin' to Beveridge Park,
And the next stop's Kirkcaddy!

A different kind of youthful experience is recorded in some verses by V. de S. Pinto which appeared a short time ago in *The Observer*. The author describes his reactions to the sound of a distant train in the night hours:—

And I become a little boy
Who has been shivering with fright,
Thinking of headless men and ghosts,
And all the horrors of the night.
Then through the darkness comes to me
The whistle of the blessed train,
And the ghosts and horrors are only shadows
And the world is clean and safe and sane.

Some day, perhaps, a poet yet unborn will set down the wild, sad songs that porters sing in the small hours, presumably to keep their spirits up, or to apprise the somnolent traveller that they are no "headless men and ghosts" whose nocturnal commerce echoes so soundingly beneath the vaulted roofs of stations, but frail creatures of flesh and blood like himself.

As well as such direct reflections in poetry as those quoted, railway influence can be deduced elsewhere. In "Maud" for example, Tennyson makes his central figure a young man whose father has committed suicide because "a great speculation had failed." It is not inconceivable that his theme was suggested by the Railway Mania years from 1844-46, although the poem did not appear until 1854. A railway *débâcle* would at least be a loftier inspiration than the financial crash which reduced the poet to temporary poverty in 1842, when his savings vanished in the ignominous failure of the Patent Decorated Carving Company.

Tennyson freely acknowledged his debt to the railway in the poem "Godiva," which he states in the opening verse to have been inspired by the view from the bridge at Coventry station. There is an interesting link with the same poet at Camelford (Southern Railway), which appears in the "Idylls of the King" as "Camelot." A nameboard announcing it as the station for Tintagel preserves a certain touch of Arthurian romance, though we should prefer to hear the information imparted by a porter with a trumpet.

It was in *The Train*, a journal of light reading presumably so called because it provided suitable fare for railway travellers, that the Rev. C. L. Dodgson first wrote under his pseudonym of Lewis Carroll. An extract from his verses in the first number will serve as an appropriate conclusion:—

The steam is up and away we go!
Through vales and pastures green;
By the old roundabout turnpikes slow
Ne'er had these lands been seen.
Hamlets, villages, cities, seas
Sever'd as by a wall,
May sing to each other like birds on trees
For the Train unites them all.

The author of "Alice in Wonderland" here seizes upon a feature of the railway which is only now being fully exploited by excursions and rail cruises. Travellers by train penetrate the very heart of the country, while motorists are obliged to potter circumspectly through its built-up areas.

OVERSEAS RAILWAY AFFAIRS

From our correspondents

TANGANYIKA

Financial Results in 1934

The total revenue from the Tanganyika Government Railways during 1934 was £505,540, an increase of £33,151 as compared with 1933 and £55,540 or 11·9 per cent. better than the estimated revenue for last year. The following is the distribution of the 1933 and 1934 revenues:—

	1933	1934	Increase or decrease
	£	£	£
Coaching ...	80,403	76,609	− 3,794
Goods ...	352,864	401,555	+ 48,691
Telegrams and sundries ...	29,308	19,949	− 9,359
Steamers ...	7,814	5,427	− 2,387
	470,389	503,540	+ 33,151

QUEENSLAND

Financial Position

The railway earnings for the seven months ended January 31 show an improvement of £450,893 compared with the corresponding period of the previous year, while the expenditure increased by £245,364. The earnings per train mile increased by 2½d. while the expenditure decreased by ¼d. per mile, notwithstanding the increased expense due to partial restoration of salary and wage reductions.

Carriage of Starving Livestock

The complete absence of monsoonal rains, which almost invariably fall in Queensland during January and February, is occasioning much anxiety. Although excellent rains have been experienced in the south-eastern quadrant of the State, the western areas are suffering from acute drought. Scores of thousands of sheep are being moved to more favoured localities, and the Railway Department is finding difficulty in providing sufficient trucks. Cattle wagons which convey one tier of sheep only are being used extensively to supplement the sheep vans. Some of the sheep are being trucked for distances as great as 1,000 miles. Substantial rebates are allowed, so that the business is not remunerative to the railways.

Beautification of Stations

The establishment of platform gardens is encouraged in Queensland, as enhancing the appearance of many railway stations. Cash prizes are awarded yearly in each of the three divisions of the State. It has been found that in some instances there is a tendency to concentrate effort on that part of the year when judging takes place and somewhat neglect the gardens at other times. It has now been decided to judge the gardens twice yearly and award prizes on the aggregate of markings. The allocation of marks has also been revised, more being allotted for what might be deemed permanent plants such as ornamental trees, shrubs, creepers, &c., and less for flowers which bloom annually. Thus when staff changes substitute a poor gardener for an enthusiast the garden will not disappear, as has been the case occasionally in the past.

NEW ZEALAND

Exceptional Week-End Excursion

A week-end excursion which, at any rate for New Zealand, covers an exceptionally long distance, was arranged to take place during February. It started from some distance north of Auckland, and had for its objective the Rotorua Hot Lakes district, the distance covered being some 700 miles, all by train. To guard against monotony on so long a journey, a Maori band was engaged to give music and entertainment *en route*. Furthermore, a four-hour halt was scheduled at Auckland, where it was arranged for the band to parade the streets.

Christmas Traffic

A further increase in Christmas traffic, as compared with 1933-34, was registered this winter, some 8 per cent. more passengers being carried, and 6 per cent. higher revenue being earned. Improvements in the standard of comfort and convenience provided on the trains, and a popular preference for the safety of rail travel, as well as the manifestation of greater interest in the various resorts served by the railway, are among the principal reasons assigned for the improvement in this special traffic.

ARGENTINA

"Go-Slow" Movement on B.A. Provincial Railway

During February, a "go-slow" movement was initiated among the employees of the B.A. Provincial Railway as a protest against the retention of the sums deducted from their wages during 1933 and 1934, as an offset to the fall in the receipts and to avoid dismissals, in accordance with the arrangement made by all the railways with their staffs. The employees of the Provincial claimed that all the other railways except their own had suspended these deductions, and demanded that they be returned, failing which they would adopt the expedient known as "working to rules" and thus interfere with train working. As the railway administration declined to accede to this demand, the "go-slow" movement was put into force, with the result that the train services were more or less disorganised for the best part of a week. Normal working was resumed on February 22, after an agreement had been reached between the Provincial Government and the railway employees to reduce the wage cuts from 8 to 4 per cent. as a preliminary step to removing them altogether. The Government also promised that no reprisals would be taken in connection with the movement.

Maize Harvest Statistics

If the figures issued by the Ministry of Agriculture relating to the estimated area sown with maize this year prove correct, the coming maize harvest is likely to surpass all previous records. The area sown is put at 7,030,000 hectares (17,575,000 acres), or 516,000 hectares (1,290,000 acres) higher than last year, an increase of 7·9 per cent., mainly due to increases registered in the Provinces of Buenos Aires and Cordoba. The official report states that, although in some districts there has been slight deterioration owing to the great heat and comparative lack of rain, the condition of the sowings can be described as good, and a satisfactory harvest is expected.

CZECHOSLOVAKIA

The State Railways in 1934

The deficit on the year's workings of the Czechoslovak State Railways for 1934 is considerably less than that shown by the accounts of previous years during the economic crisis. A slight improvement in receipts and an important economy in expenditure have resulted in a total improvement to the extent of 200 million crowns. Freight receipts amounted to 1986·2 million crowns (+ 101·2 compared with 1933), passenger traffic receipts to 715·3 (− 44·5), and other receipts to 486·5 (− 23·1), so that the total incomings were 3,188 million crowns, or 33·6 millions more than in 1933. The drop in passenger receipts was due to reduced fares and not to a decline in the number of passengers carried (these increased from 194,600,000 to 202,200,000). The total number of railway employees at the close of the year was 133,974, an increase of 22 on the figure at the close of 1933.

ITALY

Co-ordination of Rail, Road, Sea and Air Services

The Corporation of Sea and Air, which was officially instituted by Signor Mussolini at the beginning of March, has been dealing with the co-ordination of sea and air services with land transport. The Federation of Industry and that of Air Transport had previously submitted a report, in which attention was drawn to the necessity of such co-operation in the interest of future developments of all the three forms of transport. It was

XUM

submitted that in future the official representatives of these federations should participate in an official capacity at all national and international congresses dealing with traffic in general. Another interesting proposal submitted to the corporation was, that aerodromes should be established as near as possible to railway stations and that, where this was impossible, rapid connections with the railway stations should be arranged. It was further suggested that the possibility of constructing joint stations should be studied, where railway, road and air services would be centralised.

Railway Reorganisation at Milan

Important works in connection with the reorganisation of the Milan railway services have now been taken in hand between Rogoredo and Lambrate, subsidiary stations to Milan Central. The double track lines from Bologna and from Genoa join just beyond Rogoredo, at Trecca junction, and thence to Lambrate there are four tracks two of which are used exclusively for goods and two for passenger traffic. The works now in progress comprise the widening of the embankment from Rogoredo to Lambrate over a distance of 2½ km. (1½ miles) and the laying of an additional double track so as to make the Bologna and Genoa lines independent of each other: Trecca junction will disappear altogether. This widening involves the lengthening of all underbridges, some of which span main roads, by 8 m. (26 ft. 3 in.).

Other works include the doubling of the track from S. Cristoforo to Porto Romana, for which tenders have already been invited by the administration. Meanwhile, a survey is being carried out for the construction of a junction line between S. Cristoforo and Certosa (Musocco) via San Siro, where the racecourse is situated. The opening of this line will mark the completion of the entire reorganisation programme referred to in issues of THE RAILWAY GAZETTE dated February 14, 1930 and September 11, 1931, which dealt with the new Central station at Milan. At present the State Railway lines within the city of Milan have a track length of 387 km. (240½ miles).

THE FAR EAST

New Rolling Stock for Japan

An additional 3,000 goods wagons are to be built by the Japanese railways at a cost of Y.10,000,000. There is a considerable increase of goods traffic on the Japanese lines, and for January, 1935, an increase of over Y.1,060,000 is reported as compared with January, 1934. The freight figure for January, 1935, reached Y.175,000,000.

Undersea Railway Tunnel

Arrangements are being made by the Japanese Ministry of Railways for direct rail communication between the mainland and the Kyushu Islands by a tunnel to be constructed under the sea. This will provide through rail access with Nagasaki, Moji, Kagoshima and Fukuoka. The tunnel will take about four years to build and will cost about Y.35,000,000.

Hunan-Hupeh Railway

Extensive schemes for repairs and replacements on the Hunan-Hupeh railway have been authorised by the Chinese Ministry of Railways. These include the rebuilding of locomotives, replacement of sleepers, and general repairs. The expenditure approved for this work is $3,000,000.

Miscellaneous Chinese Items

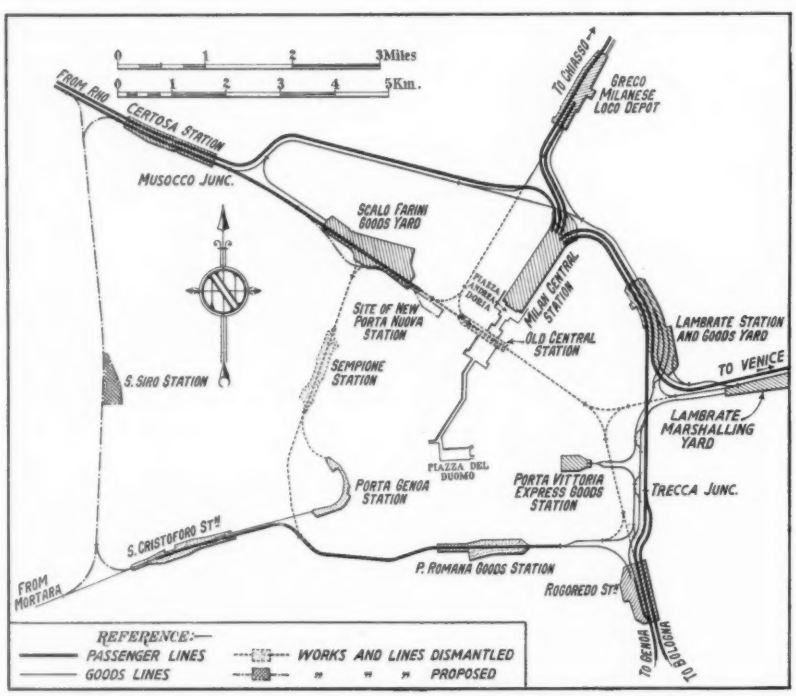
The completion of the doubling between Shanghai and Nansiang on the Nanking-Shanghai Railway is timed for March of this year. The 31-km. Taierchwang-Chaochwang branch of the Lung-Hai Railway has now been completed. It is largely for the transport of coal, and follows the Shantung-Kiangsu border.

Tatung-Puchow Railway

This north-south link connecting the Peiping-Suiynan and Lung-Hai Railways is being constructed by the Shansi provincial Government with assistance from Nanking, and is of metre gauge. From Tai-yuan, which is near its central point, about 200 km. have now been completed southwards and another 200 km. of earthwork are finished to the north of that city.

Nanking-Wuhu-Kiangshan-Yen-Ping Route

Another important line under construction is also an artery running from north to south. The first section of it is the nearly completed Nanking-Wuhu Railway, and the second, from Wuhu to Shenching on the way to Sunchiapu, is already in operation. Further south again it will cross the Chekiang-Kiangsi Railway at Kiangshan and continue to Yen-ping in Fukien, with the idea of eventual extension to Canton. The length of line at present constructed, under construction and projected is 500-600 km., but the final extension will double that length and provide a direct trunk route between Nanking and Canton. Connection is made at Nanking with the Nanking-Shanghai Railway.



Sketch map showing new Milan works now taken in hand and also lines dismantled following the opening of the new Milan Central station in 1931

SWITZERLAND

Federal Railway Loan

The Swiss Government has now made an arrangement with Swiss banks for the issue of a 3 per cent. loan of 100 million francs on behalf of the Federal Railways. The rate of issue will be 93·65 per cent. in addition to 0·6 per cent. for stamp duty. This loan will mature in 1960, but is redeemable by draw in 25 annuities. It is to serve for the partial conversion and redemption of the 5 per cent. Fourth Electrification Loan of 150 millions of the year 1924 and of the 5 per cent. Sixth Electrification Loan of 50 millions, of the year 1925.

IMPRESSIONS OF OVERSEAS TRANSPORT

XVI—Up-to-date transport conditions prevail in the larger islands of the Pacific, and those of the Hawaiian group are connected by daily steamer and air services

By A. W. ARTHURTON, formerly Secretary, British Railways Press Bureau

MY voyage to New Zealand was made from San Francisco in the *Monterey*, one of the magnificent liners of the Oceanic Steamship Company (Matson Line). I was naturally predisposed to travelling by ships flying the British flag, but the experience in crossing the Pacific on the *Monterey*, and later on to Sydney in the sister ship *Mariposa*, was one of luxurious comfort, good "eats," as the Americans say, assiduous service, together with plenty of games and entertainment, which made the time fly.

Today the richest fields of travel are embraced by the Pacific, Hawaii, Samoa, Fiji—a chain of enchantment stretching under the Southern Cross to the island Dominions of Australia and New Zealand. The 20,000-ton Matson liners, *Mariposa* and *Monterey* are the largest employed in the American-Australasian trade. The vessels are oil-fired and have a speed of 22 knots. There are nine decks and each ship will accommodate approximately 500 first class and 250 cabin class passengers. The state-rooms are unusually large, with cot bedsteads, and nearly all arranged as outside rooms. The majority of first class rooms have private bath or shower and all have their own private toilet. Running hot and cold fresh water is in every cabin and in every bathroom, and an ultra-modern ventilation system changes the air every few minutes. Each cabin has its own telephone, and on each liner there is a complete plant for printing the daily newspaper, menus and programmes; also a cinema, and a broadcasting system by means of which various shore programmes as well as the ship's orchestra may be radiated throughout the vessel. There is an exceptionally large lounge and a ballroom veranda extending the width of the ship, spacious games decks, out-door swimming pools, gymnasiums, library and writing rooms, as well as shops, laundry, barber shop, photographic studio, a night club, and skilled dental and nursing services.

These liners call at Los Angeles and then, in less than five days, swing past old Diamond Head into Honolulu Bay, completing the California to Hawaii crossing on a rapid transit schedule of 400 to 500 miles a day. Another five days brought us to Pago Pago (pronounced Pang-o) the capital of American Samoa and a gem of South Sea beauty; three days longer to Suva, the port of Fiji, and three more days to Auckland, New Zealand.

Departure from Honolulu

The hilarious scenes which mark the departure of a liner from a port of call were new to me and in the South Seas they are more than usually exciting. In addition to the hundreds of coloured streamers thrown by passengers to their friends below on the quay, there is usually a band of native musicians who play and sing haunting South Sea melodies while shouts and cheering combine to render the scene a memorable one. At Honolulu also garlands of flowers, or *leis* are hung round the necks of passengers both on arrival and departure, and custom decrees that these must be cast into the sea as the vessel steams away, to float back to the island.

Transport in Honolulu, the holiday place of wealthy Californians, is thoroughly up to date. The street car system is modern and the cars, which are open at the sides, run with almost the speed of trains. There are thousands of modern motorcars for sight-seeing tours.

In Suva, the port of Viti Levu, the largest island, and the capital of the Crown Colony of the Fijian group, modern cars and motor coaches are available for the tourist who wishes to see the delightful tropical scenery. There is also a railway about 100 miles in length which runs along the west coast of the island and has the distinction of being one of the few free railways in the world. It belongs to the Colonial Sugar Refining Company of Australia and was constructed for carrying the sugar cane to the refineries, but on certain days in the week a passenger train is run for the benefit of the inhabitants of the district. No fares are charged, and naturally the train is well patronised.

A novel method of conveyance for mails is adopted in the Tongan Islands. One morning we sighted Tin Can Island and letters were placed in a tin can and dropped overboard, to be picked up by a native in an outrigger canoe, taken to the island and stamped with the royal Tongan stamp, which is much prized by stamp collectors. Hence the name Tin Can Island.

Crossing the Line

The ceremony of "crossing the line," when all who had not previously crossed the Equator had to go through the ceremony of initiation by King Neptune and his myrmidons, during which shaving with hoop iron and a subsequent ducking took place, seems to have fallen into disuse on modern liners. Instead we were presented in our cabin with a scroll purporting to be from King Neptune and signed by his secretary, Davy Jones, conferring upon us the honour of membership of the select brotherhood of the sea and intimating to all his subjects that we were enrolled on the list of that august body.

In addition to the trans-Pacific services, a channel service linking the entire group of Hawaiian Islands is run by the Inter-island Steam Navigation Company of Honolulu. This maintains a fleet of steamers on the inter-island service which is of great benefit to tourists. There are numerous islands in the Hawaiian group, and the steamers *Hunauula*, *Walaleale*, and *Hualalai* run every day to one or more of these.

Inter-island Airways also, a subsidiary of the steamship company, maintains four Sikorsky S-38 Amphibian planes, each powered with two Pratt and Whitney Wasp engines of 420 h.p. Each plane has accommodation for nine passengers in addition to the pilot and assistant pilot, and all are in constant communication by wireless with the operations office at Rodgers Airport, Honolulu. There is a daily service between the principal islands in addition to trips to the island of Hilo by aeroplane, thence to the National Park by motorcar and back to Honolulu by either 'plane or steamer.

Whether Sir Charles Kingsford-Smith's recent pioneer flight across the Pacific from Australia to Oakland (California) will result in the establishment of a regular aerial service in the near future may be problematical, but for those who are air-minded, these inter-island services and those on the Californian coast are an earnest of greater development in this direction in the future.

XUM

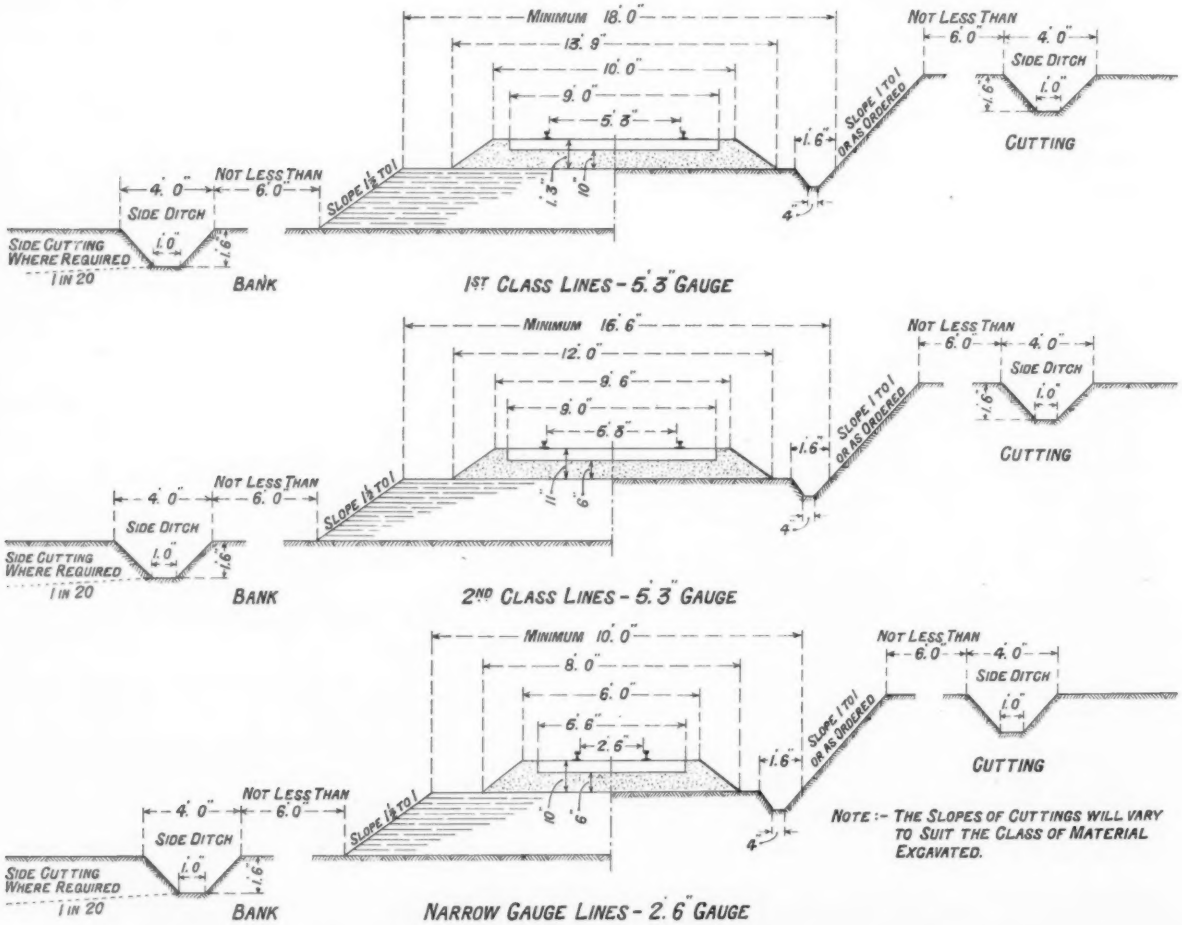
PERMANENT WAY IN VICTORIA

A century's development of permanent way construction and maintenance described by Mr. J. M. Ashworth, Chief Engineer of Way and Works, Victorian Government Railways

THE Australian State of Victoria has figured largely in the public eye recently by reason of its elaborate centenary celebrations which were formally inaugurated in October by the Duke of Gloucester and have continued during the past six months. Although the State is but 100 years old, its railway system had its origin eighty years ago, and, as recorded on page 418 of THE RAILWAY GAZETTE of September 14 last, the first line to be opened (although not the first authorised) on the Australian continent was the two-mile line from Flinders Street to Port Melbourne (then called Sandridge). This was built by private enterprise and opened on September 13, 1854, by the Melbourne & Hobson's Bay Railway Company.

A number of other short railways was constructed soon afterwards, but despite substantial assistance from the Government, the private railway companies which owned them were unable to carry on successfully in a new country where the work of transport was largely developmental. Legislation passed in 1857 authorising the Government to undertake the construction and operation of railway lines resulted in the acquisition of the private lines, and by July 1, 1878, practically all the railways of the State had been merged into a national system. At that time there were 967 miles of railway in operation; today there are 4,721 route miles open for traffic. The construction of railways since 1892 has been carried out by the Railways Construction Branch, under the control of the Board of Land and Works. After construction, the lines are transferred to the Victorian Railways Commissioners, who are then responsible for their operation and maintenance.

In connection with the centenary celebrations the Institution of Engineers, Australia, prepared a comprehensive symposium of articles on engineering development in the State, and the following details of permanent way progress are based largely on information prepared for that



Standard drawings of earthwork, ballast, and track for first and second class broad gauge and for narrow gauge lines, Victorian Government Railways

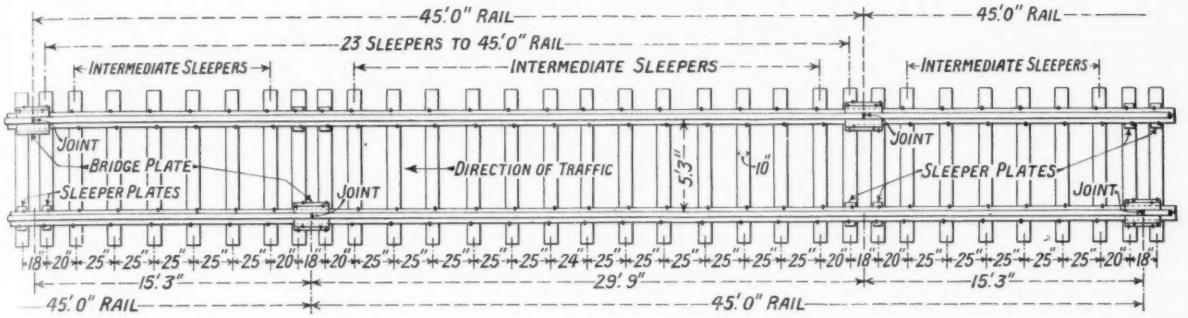
purpose by Mr. J. M. Ashworth, Chief Engineer of Way and Works, Victorian Government Railways.

In the construction of the early lines the tracks were laid with iron rails in lengths of 23 ft., the weight varying from 50 to 80 lb. a yd. When, in 1881, heavy renewals commenced, 75 lb. rail in lengths of 23 ft. was adopted for relaying important lines. The standard has been progressively raised, and at the present time for important country and suburban lines 90 lb. and 110 lb. rail, respectively, are generally used, having the present maximum length of 45 ft.

A recent development is the welded rail joint, which not only reduces maintenance but also affords more comfortable travelling. Experiments were begun in October, 1931, of rails welded into lengths up to 225 ft., and, by chains radius have been freely used. Branch lines in mountainous country have been constructed in a few cases with grades of 1 in 30 and curves of 8 to 10 chains radius, but normally this class of line has a ruling gradient of 1 in 40 and minimum curves of 15 chains radius. As traffic has grown, important economies in train operation have been secured from time to time by easing the limiting grades on important lines. For example, the ruling gradient from Dimboola to Ararat has been reduced from 1 in 50 to 1 in 100.

Bridges and Viaducts

The majority of the bridges are of simple design, the chief exception being several of the continuous girder type, built in early days. The longest span (dating from



SCHEDULE OF QUANTITIES

Item	Size	Weight each	Per 45 ft. of Single Track		Per Mile of Single Track	
		lb.	No.	Cwt.	No.	Tons
Rails, 90 lb. "A.S." Class	45 ft.	1366·830	2	24·408	235	143·395
,, 110 lb. "A.S." Class	45 ft.	1653·080	2	29·520	235	173·425
Fishplates, 90 lb. "A.S." Class	25 in.	32·621	4	1·165	470	6·845
,, 110 lb. "A.S." Class	25 in.	38·730	4	1·383	470	8·126
Fishbolts	1 in. by $5\frac{3}{8}$ in.	2·035	8	0·145	940	0·854
Spring Washers	1 in. by $\frac{3}{8}$ in. by $\frac{3}{8}$ in.	0·177	8	0·013	940	0·074
Bridge Plates, 90 lb.	25 in. by 9 in.	31·200	2	0·557	235	3·273
,, ,, 110 lb.	25 in. by $9\frac{3}{4}$ in.	38·100	2	0·680	235	4·000
Sleeper Plates, 90 lb.	8 in. by 9 in.	9·800	4	0·350	470	2·056
,, ,, 110 lb.	8 in. by $9\frac{3}{4}$ in.	12·100	4	0·432	470	2·539
Dogspikes (Round)	$\frac{3}{4}$ in. by 6 in.	0·900	16	0·129	1880	0·755
,, (Round)	$\frac{3}{4}$ in. by 5 in.	0·775	84	0·581	9870	3·415
Sleepers	9 ft. by 10 in. by 5 in.	224·000	23	46·000	2699	269·900

Standard drawing of 90 lb. and 110 lb. permanent way, Victorian Government Railways

reason of the satisfactory results obtained, the Thermit process was adopted in relaying 100-lb. and 110-lb. rails on the Melbourne electrified suburban lines. This system was briefly described and illustrated on pages 839-840 of THE RAILWAY GAZETTE of June 23, 1933, at which time about 10 track miles of long rails had been laid. At the present time some 40 miles of welded track now exist in lengths up to 225 ft. on the straight and curves of over 60-chain radius; on curves of increasing sharpness the lengths are progressively less. The welding is carried out *in situ* where the interval between the passage of trains permits. The standard spacing of the sleepers, originally 3 ft. (except at rail joints) has similarly undergone progressive reductions, and a considerable mileage of track now has sleepers spaced 2 ft. 2 in.

The nature of the country traversed by most of the important lines in Victoria has necessitated the adoption of ruling gradients of 1 in 50. With this grade very flat curves of 40, 60, and 80 chains radius were adopted for the earliest lines, but since 1873 curves of 15, 20, and 30

1857) is of 210 ft. over the Maribyrnong River at South Kensington. The highest bridge is the Maribyrnong River viaduct near Albion, built in 1929. This consists of 13 spans of 61 ft. and 12 spans of 39 ft. and carries double tracks at a height of 180 ft. above the bottom of the valley. The longest viaduct on the system (nearly $1\frac{1}{2}$ miles) is of timber, with 501 openings of 15 ft. and one opening of 20 ft.; it crosses the River Yarra flats at Yarra Glen.

The rapid increase in the weight of locomotives in the past thirty years has necessitated the strengthening and reconstruction of bridges on many of the lines. In some cases advantage has been taken of electric arc welding as a means of increasing the carrying capacity of the structures. The first instances in which this was used in Victoria and perhaps the first job of its kind of comparable magnitude in the world, was at the Murray River bridge at Echuca, a notable pioneering work. In 1902 Cooper's E 40 loading was adopted as standard for bridge design, but since 1907 the designs have been based on E 50.

XUM

TRAIN DESCRIBER WITH PRINTED RECORD

Apparatus designed to record signals and the times when they are given

THE extension of automatic signalling in recent years and the consequent increase in the distances between signal-boxes, covering in some cases a considerable number of block sections, has led to the use of various systems of train describing incorporating the storage or magazine principle. This system was first used in this country, as far as we are aware, for the original describers on the District Railway, when electric traction was introduced. Before that time, however, various forms of train describer having a simple indicating apparatus without the storage feature had been used to some extent, chiefly between busy signal-boxes in crowded areas, where bell code signals were insufficient to do what was required. Some of these devices, such as the Walker describer, were designed in the early years of signalling. On some railways block instrument "dial signals" were given, consisting of beats to the right or left of the block needle, for the purpose of describing the train, while on the London, Chatham & Dover, single-needle instruments fitted with small bells were used instead of ordinary block bells, the train destinations being signalled by the Morse code. This system is still in use in conjunction with Sykes lock-and-block.

The necessity for storage type describers was felt when, on the introduction of automatic signalling, there was a possibility of a number of trains leaving one signal-box before the first of the series had to be dealt with at the next. With the older single-description devices, the signalman had to rely on careful booking of the signals received in order to be sure of dealing correctly with each train as it approached. The indication visible on the receiving apparatus was merely the last signal transmitted, which did not necessarily refer to the train then approaching. In fact it hardly ever did so, save at times of very light traffic. By storing the signals received it was made possible to exhibit them in order as the various trains approached, so that the signalman was never in doubt as to the one with which he had to deal at a given moment. These machines contained, however, no recording apparatus showing what signals had been given by them, for use in the event of subsequent disputes, except in the case of those working with perforated tapes, in which the punched paper could, of course, be examined afterwards if required. It could not, however, be read directly without a knowledge of the code used, and was not intended to be seen by the signalman.

In order to furnish a simple arrangement whereby the signals could be printed in ordinary type, and at the same time to provide a continuous magazine, the apparatus shown in the accompanying illustrations has been con-

Sykes printing train describer showing white arrow signal indicating first train approaching

Cover removed from describer showing printing heads, paper drum, and printing magnets. All trains have been dealt with

structed by W. R. Sykes Interlocking Signal Co. Ltd., Clapham, London, S.W.4, under Patent No. 353,901. It is intended for use with the step-by-step transmitters, working on either the constant direction or self-homing methods, and consists of two solenoid-driven printing heads with carbon tapes, one of which contains the train description wheel and the other the date and time wheel, both of which are, of course, struck simultaneously. The paper travels over a sloping desk and can be made to show as many trains as may be required. The machine illustrated shows fourteen at a time. To indicate to the signalman which is the first train coming, a " next train " indicator is provided in the form of a white arrow, which moves forward with the paper record as each signal is received. This arrow, seen on the right hand side of the desk, is therefore always pointing to the train with which the signalman is at the moment concerned, the others above the arrow being still to deal with. As each train passes him, the signalman depresses the handle seen on the right below the desk and this causes the arrow to move back to the next description, or automatic cancelling by the passing train can be used instead.

Should all the trains be dealt with before another is described, the arrow disappears, but reappears at the top of the desk when a fresh indication is signalled. The arrow can be made to travel as far as required, but indicates for a total of seven trains in section on the apparatus illustrated.

Alongside the description signal appears the date and time when it was given. It is intended in future to show the time in tenths of a minute. An impulse clock is, of course, required for a given area where the describers are in use. There are only three relays in the machine. The desk is floodlit and the red signal lamp illuminated all the time there is a train described that has still to be dealt with. The desk can be opened to enable the signalman to write any special message or remark on the record, if necessary, and the lineman can see when the paper is in need of renewal by means of the window on the left hand side. The printed record can, of course, be detached, say, daily and forwarded to the Traffic Department for reference.

As all signals are placed on record it is impossible for the signalman to say afterwards that he received a signal different from the one he actually did, for the fact can always be checked, while the magazine capacity can be extended indefinitely without increasing the number of relays or other electrical parts. The apparatus illustrated was made for trial and the arrangement can be modified to meet special conditions without difficulty.

WELLINGTON (NEW ZEALAND) STATIONS

THE laying of the foundation stone of the new station at Wellington by the Duke of Gloucester,* last December recalls the unusual history of the various stations in the Dominion capital. The first of these was opened at Pipitea on April 14, 1874, when the eight-mile line to Lower Hutt was brought into use. A short extension of this line southwards from Pipitea to Ballance Street was completed on November 1, 1880, and a new station, known as Wellington station, was opened on the site of the existing railway headquarters. The station building then used was 150 ft., and its platform 420 ft., in length. Meanwhile the present railway wharf had been completed in April of the same year. Three years later it was decided to move Wellington station to the site of the present Lambton station† and to close the original Pipitea station, with the result that Lambton station was opened for passengers in 1885, a year after Pipitea had been closed: Bunny Street was also extended to Waterloo Quay.

Meanwhile the Wellington and Manawatu Railway Company—which had begun to construct its line in 1882—had intended to run into Wellington station, but, as no agreement was reached in respect of running powers or interchange of traffic, a supposedly temporary station was opened on reclaimed land at Thorndon in November, 1886, and there it is still in use. The Thorndon-Longburn (Manawatu) Railway was worked by the company until it was taken over, in December, 1908, by the Government in anticipation of the completion of the main trunk line to Auckland. It was also in view of this important pending event, and of the Wellington-Hutt doubling that proposals were formulated for a new Wellington station in 1907. The following year the Wellington Harbour Board prepared a scheme of extensive reclamation to provide for new wharves and railway approaches, but it was only after years of negotiation that this scheme came to fruition and a contract was let for the construction of the Thorndon sea wall to make reclamation possible. This work involved the laying of large concrete blocks in 30 ft. of water, and on its completion, silt was dredged from the harbour and pumped over the wall to reclaim the large area behind it, upon which the new station is now being built.

It was, however, some time before the reclamation was sufficiently consolidated to permit of the laying of sidings or construction of buildings upon it. In fact, it was as recently as 1930 that work was started on the goods yard and the construction of the 500-ft. steel and concrete goods shed upon the older part of the reclaimed area, a work completed in the following year. As we recorded at the time, the contract for the construction of the new passenger station was let some fifteen months ago, and we have also had occasion to describe the exceptional methods of construction which have been dictated by the necessity of guarding against earthquake damage* and of combatting the lack of solidity in the foundations.† Work is, however, now in full swing, and is expected to be finished in February, 1937. We cannot do better than whole-heartedly endorse the sentiments expressed in the last sentence of the Duke of Gloucester's speech when he laid the foundation stone of this remarkable building:—" . . . . I sincerely trust that the skill and enterprise shown in the construction of this station will be rewarded by a success fulfilling the hopes and expectations of the people of Wellington."

* See THE RAILWAY GAZETTE, December 21, 1934; page 1040

† See THE RAILWAY GAZETTE, November 10, 1933; page 696 (upper plan)

AMERICAN RAILWAY REORGANISATION.—The Chicago, Milwaukee, St. Paul and Pacific Railroad is to be reorganised before July 1 next, and it has announced that in consequence it will defer payment of the $900,000 of Equipment Trust Certificates which were due to mature on April 1. This company borrowed $3,500,000 from the U.S.A. Government for the January and February requirements, but it is not the intention to acquire more money from this source. The present company itself is the result of the 1927 reorganisation of the old Chicago, Milwaukee and St. Paul Railroad, whose troubles were brought about largely through the uneconomic extension to the Pacific in 1906, which is electrified for over 600 miles.

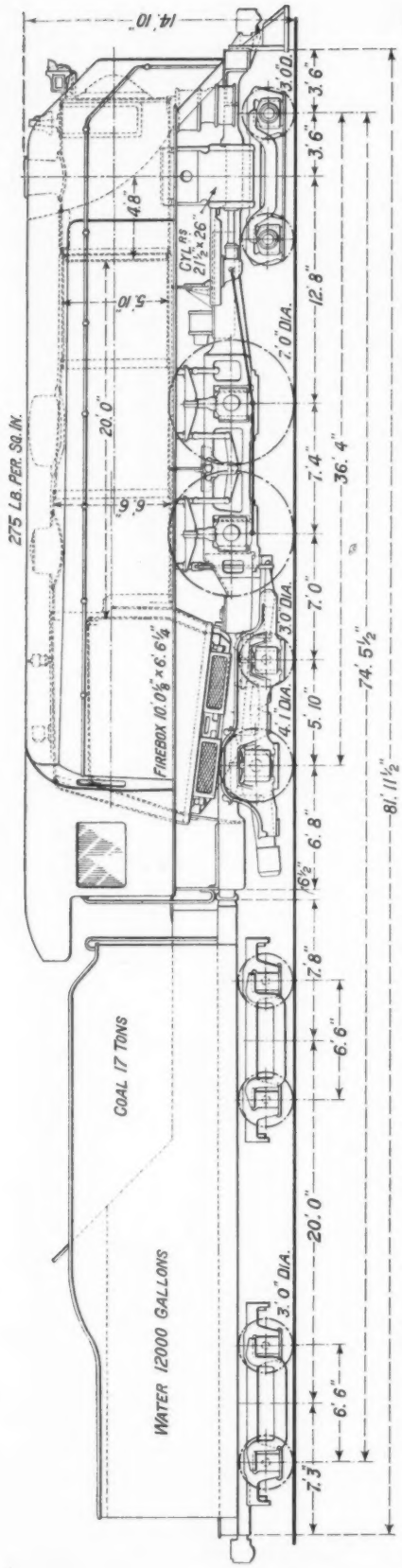
* See THE RAILWAY GAZETTE, November 10, 1933; page 697

† See THE RAILWAY GAZETTE, December 7, 1934; page 936

XUM

AMERICAN HIGH-SPEED STREAMLINED STEAM LOCOMOTIVE

Proposal for a straightforward 4-4-4 two-cylinder design



Proposed 4-4-4 partly streamlined high-speed locomotive designed by the Lima Locomotive Works for a sustained output of 2,200 h.p.

Calculated to weigh in working order, with tender, 229 long tons, and to develop a tractive force of 30,000 lb. (or with booster 43,100 lb.) this engine is provided with special methods of counterbalancing, making it suitable for a safe operating speed of 100 m.p.h.

A PROPOSED design for a steam locomotive specially adapted for working light high-speed passenger trains has been prepared by the Lima Locomotive Works, of Lima, Ohio. The design employs a straightforward combination of established basic features and incorporates two 21½ in. by 26 in. outside cylinders with the 4-4-4 wheel arrangement. Provision is made for the fitting of a booster engine to drive the rear axle of the trailing bogie. The cylinders and boiler are proportioned for a sustained horse-power output of 2,200 at all operating speeds over 30 m.p.h. At a conservative estimate this would serve for hauling a train of 250 tons at a sustained speed of 90 m.p.h. on a straight level track.

With a view to restricting the weight of the locomotive as much as possible, special attention has been given to the character of the materials to be used in building it. The boiler material is nickel steel and the frame, including the trailer extension, is of high tensile steel cut from integral rolled and forged slabs, normalised and tempered. Poppet valve gear capable of being operated at 10 per cent. cut-off is proposed.

The general design is prepared for securing as much advantage from streamlining as is consistent with accessibility of parts for inspection and maintenance, and the general appearance can be seen from the drawing reproduced herewith from an original prepared by Mr. W. E. Woodard, Vice-President of the Lima Locomotive Works, Inc.

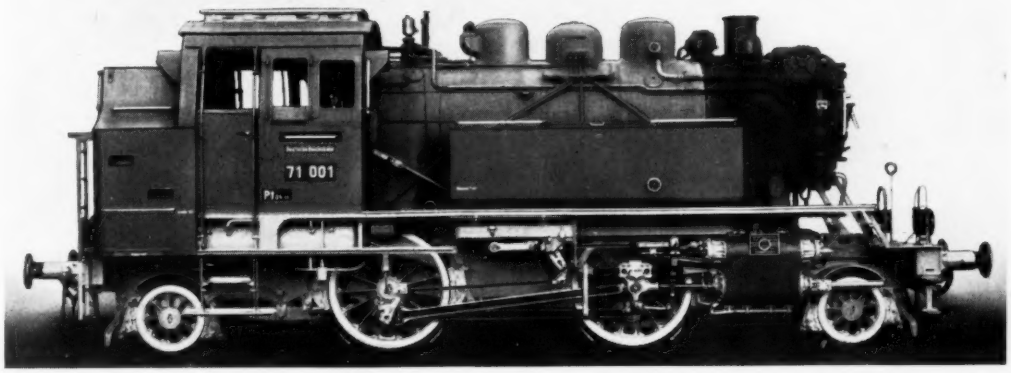
The boiler and firebox proportions are ample for the steam requirements of the cylinders, with the result that the grate will be worked at a low and economical combustion rate. At a coal rate of 88 lb. per sq. ft. of grate per hour the boiler will evaporate about 43,000 lb. of steam at 275 lb. pressure, which is ample for the maximum cylinder demands plus the auxiliaries and heating. The working pressure of 275 lb. per sq. in. was chosen as the most satisfactory figure, taking into consideration steam economy and maintenance of boiler and the desirability of a staybolt firebox construction on account of wash-out conditions.

The poppet valves were determined upon as they result in small cylinder clearances, and this factor, together with the very short cut-offs used, and advantageous steam distribution, make a substantial saving in steam per horse-power, thus minimising the demands upon the boiler. The entire design of locomotive and tender was studied with a view to producing a machine following the latest accepted practice, but adding still further improvements where such features are calculated to reduce the cost of operation and maintenance without adding unduly to the initial cost, always bearing in mind the element of safety in operation. This, it is believed, is in the circumstances a better method than that of employing the more complicated and unproved construction.

A few of the proposed dimensions other than those shown on the accompanying drawing and the foregoing text may be of interest. Maximum cut-off 60 per cent.; driving wheel diameter 7 ft. 0 in.; total heating surface 3,200 sq. ft.; grate area 65·2 sq. ft.; tractive force, main cylinders 30,500 lb., with booster 43,100 lb. In working order the engine is estimated to weigh 134 long tons (2,240 lb.), or with the tender 229 long tons. The tender has a fuel capacity of 17 U.S. tons (2,000 lb.) and a water capacity of 2,000 U.S. gallons. The adhesion weight amounts to 58½ long tons.

NEW HIGH PRESSURE 2-4-2 SUPERHEATED TANK LOCOMOTIVES

Built by the Berliner Maschinenbau A.-G. for light passenger and fast parcels traffic on the German State Railway



THE new 2-4-2 two-cylinder superheated tank locomotives of the 71 class, developed by the German State Railway present a number of interesting features and will permit of considerable improvements in service by the fast and economical haulage of light passenger trains. They are also to be used with the so-called " Leig " units (two close-coupled wagons) in fast goods traffic. The details of the design were worked out in the standardisation bureau of the Deutsche Lokomotivbau-Vereinigung (German Locomotive-Building Association) in collaboration with the Reichsbahn-Zentralamt für Maschinenbau (Central Office for Mechanical Construction), Berlin, and the Berliner Maschinenbau A.G. (late L. Schwarzkopff), which firm has built the first two locomotives of the new series. We are indebted for the following particulars to an article by Herr Reichsbahnoberrat Flemming of the German State Railway. Provision is made for the subsequent incorporation of semi-automatic stoking apparatus, and for access to and from the train, thus permitting one-man operation. These features will be embodied in later locomotives now under construction.

The accompanying illustration shows the general appearance of the first locomotive of the new series, the principal dimensions of which are as follow:—

Cylinders, dia.	310 mm. (12¼ in.).
,, stroke	660 mm. (26 in.).
Coupled wheels, dia.	1,500 mm. (4 ft. 11 in.).
Carrying wheels, dia.	850 mm. (2 ft. 9½ in.).
Boiler working pressure	20 atmospheres (284 lb. per sq. in.).
Boiler heating surface—	
Tubes, flues, and firebox	67·43 sq. m. (725·5 sq. ft.).
Superheater	28·60 ,, (307·7 ,,).
Total	96·03 sq. m. (1,033·2 sq. ft.).
Grate area	1·37 sq. m. (14·7 sq. ft.).
Wheelbase, rigid	3,000 mm. (9 ft. 10 in.).
,, total engine	8,400 mm. (27 ft. 7 in.).
Length over buffers	11,800 mm. (38 ft. 8½ in.).
Weight of engine in working order	59 metric tons (58 t. 1 cwt.).
Adhesion weight	30 metric tons (29 t. 10 cwt.).
Water capacity	7 metric tons (1,540 gall.).
Fuel capacity	3 metric tons (2 t. 19 cwt.).
Maximum speed	90 km.p.h. (55·9 m.p.h.).

The diameter of the coupled wheels will in the later locomotives of the series (from No. 71003) be 1,600 mm. (5 ft. 3 in.), which will render them capable of a maximum speed of 100 km. (62·1 m.) p.h. The locomotive illustrated is capable of reaching a speed of 80 km. (49·7 m.) p.h. in 2 minutes from rest when hauling two eight-wheeled coaches with luggage and mail compartments and seating capacity for about 120 passengers.

Constructional Features

In order to allow unrestricted use of the new locomotives on the secondary railways, the maximum axle load is 15 metric tons (14 t. 15 cwt.). This low value for such a relatively powerful machine is made possible by the use of special boiler plate material of low molybdenum alloy steel, and by a more extensive use of electric welding than hitherto employed in steam locomotives. The new machine is said to be the first locomotive of the German State Railway with a boiler pressure of 20 atmospheres (284 lb. per sq. in).

The 16-mm. (⅝-in.) plate frames are welded throughout, including all cross stays and the smokebox carrier. The welded water tanks are welded on to the frames, and the same applies to the ashpan, firebox expansion brackets, slidebar brackets, rear water tank and bunker, as well as the driver's cab. Another remarkable feature is the welded plate construction of the bissel (which is capable of 60 mm. (2⅜ in.) transverse displacement to either side), together with the axleboxes and the casing of the side check spring. In the boiler there are welded joints in the outside firebox wrapper plate, firebox, all seatings for the cross stays, fittings, safety valves, forgings and smokebox. In the next locomotives of this series the longitudinal joint of the boiler will be welded for the first time, and owing to the vital importance of this joint a special method of testing has been developed by the German State Railway.

In order to shorten the braking distance, brakes are fitted to all the wheels. A change-over and pressure-reducing valve coupled to the reversing gear ensures that the braking pressure applied to whichever carrying wheels may be leading is lower (50 per cent. braking) than that on the other wheels (80 per cent. braking). Among the special features of the equipment may be mentioned the reciprocating feed pump with Knorr feed-water heater and feed purifier, turbo-generator for locomotive and train lighting, pressure-equalising piston valves, steam heating, compressed air bell, steam whistle, and compressed air sanding gear.

XUM

IMPROVEMENTS AT DONCASTER WORKS, L.N.E.R.

A re-planning of certain shops and the work operations conducted therein have been effected, together with the installation of a number of new machine tools

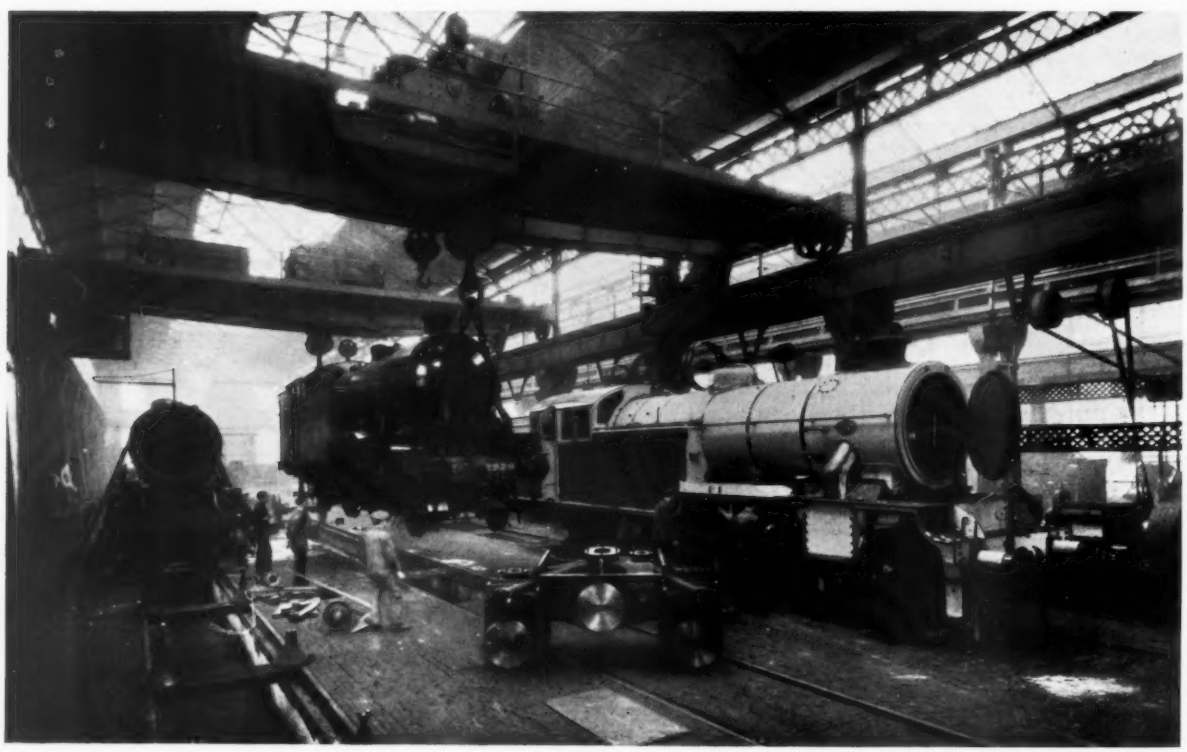
BY the courtesy of Mr. H. N. Gresley, C.B.E., Chief Mechanical Engineer of the London & North Eastern Railway, we were recently enabled to visit the company's locomotive works at Doncaster and there to inspect the alterations carried out in the machine shops and the installations of new machinery, which together have had the effect of considerably expediting output and otherwise improving the manufacture and repair operations undertaken in the shops. A range of buildings formerly utilised for certain heavy machine operations has been closed down as a result of the improvements effected in the main shops, and with the greater concentration not only has a saving in actual floor space been achieved but economy brought about under such concomitant headings as lighting, heating and general maintenance of the buildings now dispensed with.

A considerable amount of thought and planning was necessary in order to bring about this beneficial change, and the speeding up of works operations and greater convenience entailed in an all-round sense, becomes obvious as one traverses the shops under the new conditions. Of actual structural alterations there have been relatively very few, but the lighting of the buildings has been improved by new glazed roofing and other means, and it is certainly the fact that the men work under very favourable conditions in this respect, as also where the warming and ventilation of the shops are concerned. A thorough investigation of the machining processes, grouping of tools and other appliances, and transport methods was made and several ingenious adaptations have been carried into effect by those responsible for the management of the works, which have led to lower production costs together with improved outputs. In some cases it has been a transference of older machines to other sites, as for instance, locomotive depots and similar shops, where they still have a wide range of usefulness, replacing them by tools of later types, some of which, we believe, only first made their appearance at the Machine Tool and Engineering Exhibition held at Olympia in November of last year. The process is by no means complete as yet, as new machines on order have not up till now been delivered.

Some of the finest locomotives in the world have been built at the Doncaster works, and those recently turned out rank as worthy successors to all that have gone before. We were particularly impressed with the excellent finish of motion details, cylinder and boiler work, and indeed, all departments of production, and the improvements effected in connection with repaired parts are no less noteworthy.

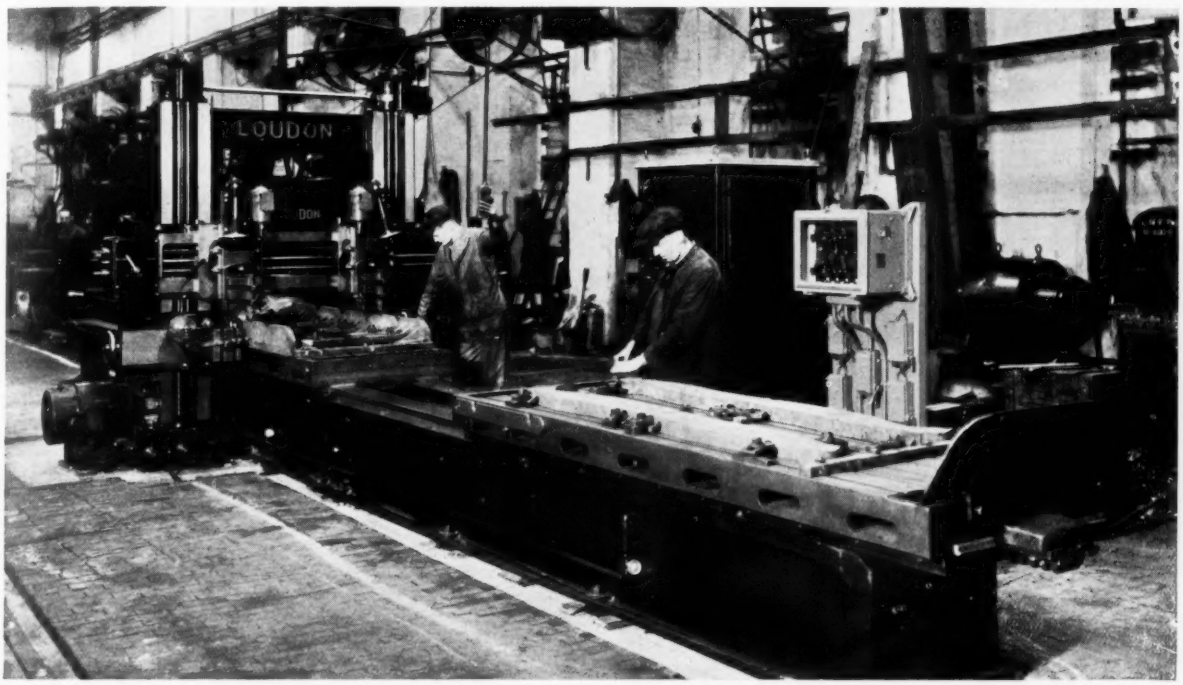
Some New Machine Tools

Among the more outstanding new machine tools which we had an opportunity of inspecting on the occasion of our visit are those illustrated and described herewith. In



View in new engine erecting shop at Doncaster works, L.N.E.R., showing 2-6-2 type three-cylinder tank locomotives under construction. Note cylinder casting in foreground

this first article we can deal with only a few, but we shall proceed in future issues to illustrate and describe others and to give some particulars relating to the operations carried out on them in machining locomotive component parts. Of particular interest is the Loudon all-electric high-speed spiral drive planing machine, a noteworthy feature being the duplex tables arranged tandemwise; one table is for setting out work while the other is for actual operation. This machine is capable of cutting speeds from 20 up to 380 ft. a minute, and is used at Doncaster for gang planing of engine parts such as hornblocks, central buffer castings, quadrant links, axleboxes, slide valves, slide bars, and the like. The machine is made on Loudon Brothers' double spiral principle, embodying the firm's patent cushioning arrangement, whereby much higher cutting and return speeds are obtained with-



New Loudon all-electric high speed planing machine with duplex tables

out any undue shock either to the machine, the ball thrust bearings, or the reversing motor; in fact, due to the regenerative action of these cushioning springs, energy is stored up, thereby assisting the reversing motor at the peak of reversal. This feature, so far as we know, is not obtainable in any other design of spiral or rack wheel-driven machine. The tool is protected and not subjected to any shock on starting to cut the metal, thereby considerably extending its life. It is stated that the high efficiency of 95 per cent. is obtainable on the gears. The machine is fitted with accelerating motion, whereby the tools may enter and leave the metal at normal cutting speeds and be automatically speeded up in the metal to the maximum cutting speed, or as desired, the machine also permitting of speeding up between surfaces to that equal to the return speed.

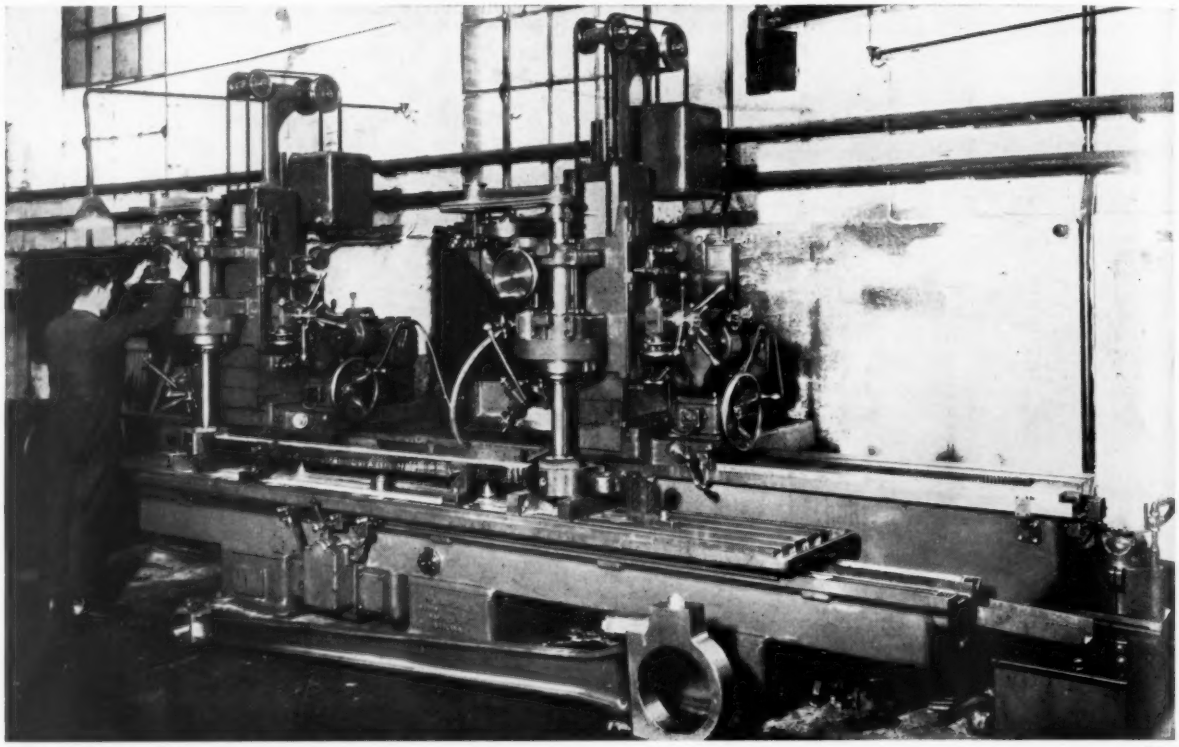
The illustration shows the table in question loaded with ten cast iron hornchecks for a locomotive tender, these being operated upon on the edges and faces simultaneously. The table in the foreground is being loaded with quadrant link forgings. The high cutting speeds available allow of the best possible use being made of tungsten carbide tools and the provision of a solenoid tool relieving attachment to the tool box lifts the tools from the work, thus precluding the abrasion of the cutting edge on the return stroke. The machine will plane surfaces 3 ft. 6 in. wide by 3 ft. 6 in. high and 8 ft. long, and with the tandem tables coupled up, 16 ft. long. This highly efficient machine is equipped with a special reversible motor drive, supplied by the Lancashire Dynamo & Crypto Co. Ltd.

As a comparison with older types of planing machines, it was common practice in most engineering shops to plane cast iron and bronze at cutting speeds of from 50 to 60 ft. a minute, but with the coming of the tungsten carbide tool much higher speeds became possible. Nevertheless, it was until quite recently a debatable point whether cutting tools could be obtained to stand up to intermittent cutting speeds of 350 to 380 ft. a minute.

Recent trials at Doncaster have proved beyond doubt that these high cutting speeds for planing work represent a sound practical proposition. As an example, tender intermediate buffer castings requiring intermittent cutting in cast iron have been successfully machined on the new Loudon planer taking $\frac{1}{4}$-in. depth of cut with $\frac{1}{16}$-in. feed at 300 ft. a minute, and $\frac{1}{8}$-in. depth of cut with $\frac{1}{16}$-in. feed at 380 ft. a minute. In the same manner hard bronze castings such as those used for big end connecting rod bearings are being regularly machined at 380 ft. a minute. With this cutting speed and the same speed of return with an 8 ft. 0 in. length of stroke the number of cycles an hour is 1,020.

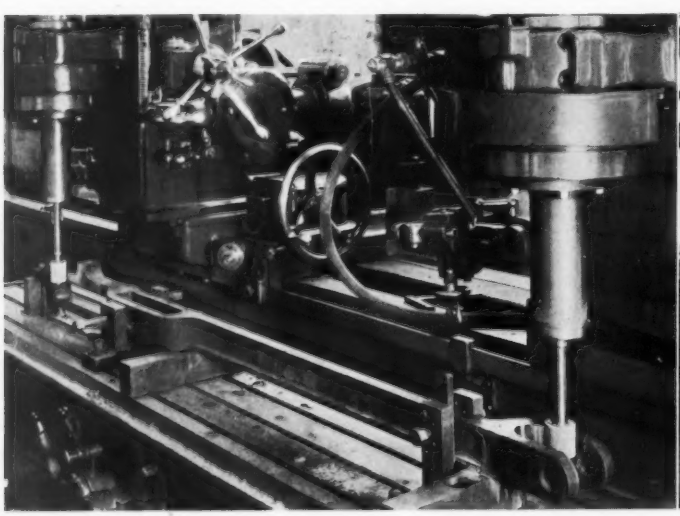
New Grinding Machines

Of equal interest and as recently installed are two latest pattern Churchill grinding machines, one of them of the double vertical type and the other a plain grinding machine, both of which are illustrated herewith. The

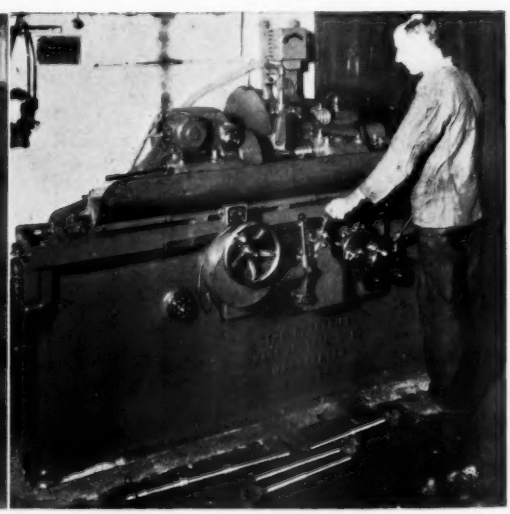


New Churchill double spindle grinding machine with two independently controlled grinding heads

double spindle vertical grinding machine has two internal grinding heads each controlled independently, and capable of longitudinal, transverse and vertical adjustment. The machine is employed for finish grinding the holes in motion parts, coupling and connecting rods, crank pin holes and the webs of built-up cranks and similar parts. The twin heads are of the planetary type, the eccentricity being adjustable by a hand wheel on the front of the head. The longitudinal and transverse adjustments are hand operated, whilst vertical movement can be operated either by hand or by power. The capstan gauge on the right of the head is geared directly to the slide wheel and there is a hand micrometer adjustment which can be engaged when required. Each head is self contained and all motions are driven by a motor mounted at the rear of the column. The machine, when photographed, was operating as shown on locomotive side and connecting rods. During this operation the table is also stationary, the holes being ground by utilising the planetary motion of the two spindles after the heads have been set the correct distance apart by means of standard length bars. The larger holes are trepanned out as a previous operation on a Kitchen



Finish grinding of motion parts on Churchill double spindle machine



Churchill plain grinding machine

& Wade duplex rod boring machine, to which illustrated reference will be made later.

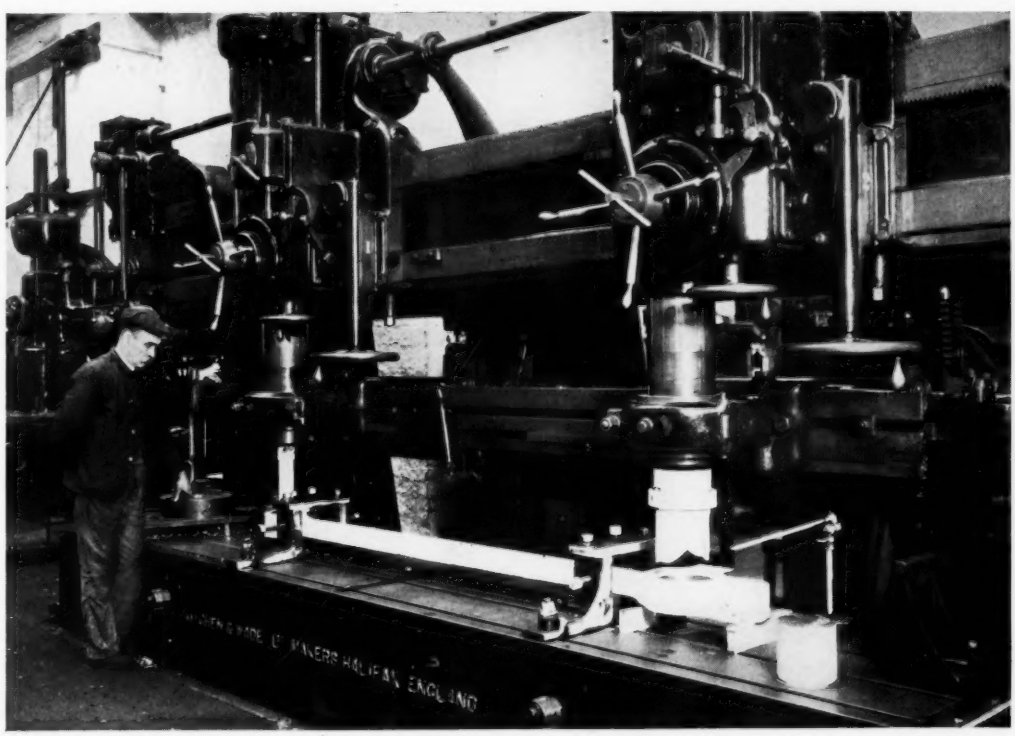
Another illustration gives a near view of the Churchill machine, showing the application of the hydraulic traverse to the work table. This is used for finish grinding after hardening of the flat work surfaces on motion parts, such as radius rods, die block slots, and fork ends, as illustrated; also eccentric rods, combination levers, union links and other similar items. When grinding these faces, the table has a reciprocating motion whilst the revolving spindles move up and down, the planetary motion having meanwhile been put out of action. This machine produces a very high finish rapidly, and appeared to us to be admirably adapted in all respects for the work given it.

The other Churchill machine is, as stated, a plain cylindrical grinder with a capacity of 10 in. diameter by 36 in. long. It has the maker's patent Hydrauto grinding wheel head, this indeed being a most noteworthy feature. It also has hydraulic traverse and an infinitely-variable speed electrically-worked drive. In order to make the machine suitable for plunge cut driving, it is equipped with the maker's standard hydraulic in-feed. Normally the micrometer feed is operated by the trip over the reversing lever as the table is traversing, but as the table is usually stationary when plunge cut grinding, a separate feed motion has to be employed. This consists of an auxiliary hydraulic motor which rotates a cam that can be engaged with the ordinary ratchet feed mechanisation, thus operating the latter when the table is stationary. This machine is employed at Doncaster for finish grinding motion pins after hardening, and also for grinding crank pins, steam brake and vacuum brake piston rods, armature shafts and other components. In our inspection of this machine at work we were much impressed by the admirable system of controls afforded to the operator. The magnitude of the feed movement can be regulated, the hydraulic quick withdrawal mechanism being entirely independent of the feed and being noted for quickly positioning the wheel in relation to the work. This feature is very useful when grinding components possessing widely varying diameters, to accommodate which it is necessary to move the wheel head backwards and forwards a considerable distance. The withdrawal mechanism is operated by a cylinder and ram type device, controlled by a lever. The use of the hydraulic withdrawal mechanism does not interfere with the setting of the micrometer feed. The head can be run back and returned to exactly the same position.

Trepanning of Rods : A Preliminary Operation

Reference was made earlier to the fact that the rods, before going to the grinding machine, have the larger holes trepanned out on a duplex rod boring machine. This was manufactured by Kitchen & Wade Ltd., and is electrically driven by an independent motor to each head. In addition to trepanning and boring the ends of coupling and connecting rods, it is used for boring and reamering large steel bushes. As illustrated, the machine is dealing with both ends of a locomotive side rod. The right-hand spindle has been raised to show the type of trepanning tool used, whilst to the right of the rod is seen the solid cylindrical block of metal removed. The trepanning tool is made from mild steel in the shape shown. The vertical cutting edges are provided with an inset of high-speed steel the full depth and width of the cutting edge. After the trepanning operations have been completed the hole is machined with a boring bar of the requisite size for grinding, as illustrated.

The main features of the machine are the extra heavy spindles and the adjustable spindle nose steadies, giving the maximum of support to the tool whilst in operation.

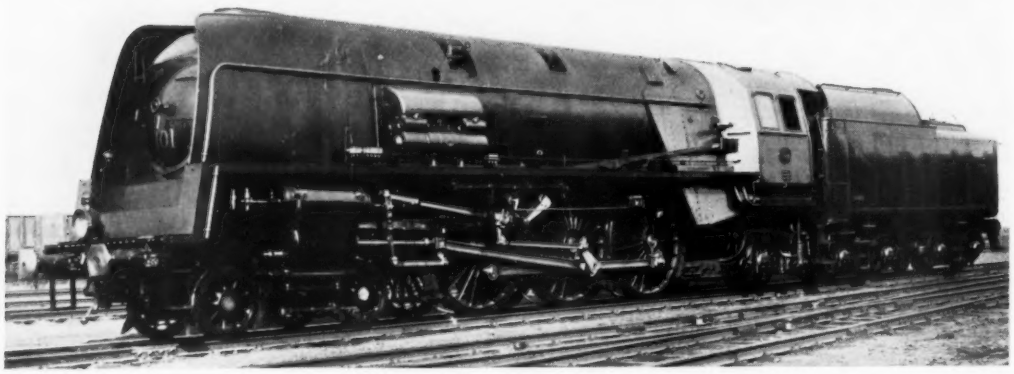


Trepanning operation on locomotive rods. Kitchen & Wade duplex rod boring machine

XUM

NEW BELGIAN PACIFIC LOCOMOTIVES

A series of fifteen powerful express locomotives for the Belgian National Railways



THE first of fifteen four-cylinder simple 4-6-2 locomotives has just been put into service by the Belgian National Railways Company. These locomotives have been designed for hauling heavy high-speed expresses, and incorporate the latest refinements in steam locomotive practice. The principal dimensions are as follows:—

Cylinders (4), dia.	16½ in.
,, stroke	28⅜ ,,
Wheels, coupled, dia.	6 ft. 6 in.
Boiler, mean dia.	5 ft. 11 in.
,, length between tube plates	19 ft. 8¼ in.
Working pressure	256 lb. per sq. in.
Heating surface, evaporative	2527·2 sq. ft.
,, superheater	1202·3 sq. ft.
,, Combined total	3729·5 sq. ft.
Grate area	53·8 sq. ft.
Overall length, engine and tender	80 ft.
Total wheel base (with tender)	68 ft. 10 in.
Overall height	14 ft. 0½ in.
Tender capacity, water	10,560 Br. gall.
,, coal	10·3 tons
Weight in working order:—	
Engine	122 tons
Tender	82·7 tons
Total	204·7 tons
Adhesive weight	69·4 tons

An A.C.F.I. feed water heater and a Friedmann injector of the closed type are fitted to the engine. The superheater is of the C.S. pattern, with separate feeders. The engines have four equal cast steel cylinders placed in line on the centre line of the bogie. They are inclined 3 per cent. Conjugated piston valve gear is used, the outside being of the Walschaerts type.

The outside cylinders drive on to the middle pair of coupled wheels; the first coupled axle, of the built up type, being driven by the inside cylinders. The boiler is of nickel steel. All carrying wheels and tender wheels are fitted with S.K.F. roller bearings. The engines, with their tenders, can negotiate curves of six chains radius.

The brake is of the compressed air automatic direct type. Sanding is by means of compressed air. Superior soot blowers, a Teloc speed indicator, and a Pyle turbo generator for lighting purposes are also fitted. As shown in the photograph, an attempt has been made to streamline at least the upper part of the engine and tender, and there is a distinct resemblance to Mr. Gresley's *Cock o' the North*, particularly in this respect and in the provision of a double blast and chimney with the whistle in front of it.

The builders of these fifteen locomotives are John Cockerill Work Forges, Usines et Fonderies de Haine St. Pierre, Atéliers de Construction de la Meuse and Atéliers Métallurgiques.

Front view of new Belgian Pacific showing its resemblance to the L.N.E.R. 2-8-2 express locomotive, "Cock o' the North," with the whistle in front of the chimney

RAILWAY NEWS SECTION

PERSONAL

Mr. H. H. Sterling, Chairman of the New Zealand Government Railways Board, is leaving Wellington for England at the end of April to investigate the latest transport developments.

Sir George Clark, Bart., D.L., whose death was announced in last week's issue of THE RAILWAY GAZETTE, was born at Paisley 74 years ago. He was,

The late Sir George Clark, Bart.,
Chairman, Great Northern Railway, Ireland, 1926-34

with Mr. Frank Workman, his future partner, in the service of Harland & Wolff Limited until 1879, when they joined forces and set up a small shipyard of their own on the other side of the river at Belfast. He retired from the firm in 1920, when it was acquired by a syndicate. It was from 1926 to 1934 that Sir George was Chairman of the Great Northern Railway of Ireland. He was also a Director of the Bank of Ireland, and for three years was Unionist M.P. in the Imperial Parliament for North Belfast, and was a Senator of Northern Ireland. Among the many other important positions he held was the Presidency of the Belfast Chamber of Commerce. Sir George was a man of strong personality, and was recognised as a leader of industry in Ulster.

We note with regret the death, on March 28, of Mr. Edmund James Morgan, formerly Chief Accountant, Central Argentine Railway, in his 81st year. He joined the C.A.R. in 1883 as Bookkeeper, and, in 1892, was promoted to be Accountant, the position he retained after the amalgamation with the Buenos Ayres & Rosario system and until his retirement in 1927. Mr. Morgan was Secretary of the Anglo-Argentine Lodge—of which he was a founder—from 1913 to 1930.

Mr. A. E. R. Mayne, O.B.E., Chief Accountant, Kenya and Uganda Railways and Harbours has retired from the service. It may be remembered that Mr. Mayne was awarded the O.B.E. in this last New Year honours list.

From the *London Gazette* of March 29:—Royal Engineers, Engineer and Railway Staff Corps—Major Henry Stuart Beville Whitley, M.Inst.C.E. (late R.E.), to be Major (March 30, 1935). Major Whitley is Divisional Engineer, Wolverhampton, G.W.R.

Latest advices from Germany indicate that in the course of their meetings on March 26 and 27, the Directors of the German State Railway unanimously re-elected Dr. Ing. e.h. Dorpmüller as Generaldirektor (General Manager) of the company for a further three years. This is Dr. Dorpmüller's fourth appointment to the office which he has held since 1926. His re-election has been confirmed by Herr Hitler. Dr. Dorpmüller's portrait and biography were published in THE RAILWAY GAZETTE of January 12, 1934.

We learn with regret of the death of Mr. H. N. Heseltine, C.I.E., formerly Accountant General of Railways in India. He joined the Finance Department of the Government of India in 1881 and rose to be Comptroller of Accounts, Central Provinces, in 1911 and Accountant General, Punjab and N.W. Frontier Province, in the following year. It was in 1914 that he became Accountant General, Railways, the post he held until his retirement in 1922. He was awarded the C.I.E. in 1918. His selection as Railway Accountant General during the war period was a particularly sound and happy one, as his practical outlook, sound principles and broadmindedness combined to make him one of the ablest and yet most approachable and helpful Accountant Generals the Railway Department ever had. After his retirement, Mr. Heseltine was offered and accepted a special appointment to overhaul the establishments employed on the various railways with the idea of reducing expenditure. His remarkable detailed knowledge of railway working enabled him to improve and simplify office procedure and reduce staff in almost all branches of working, and his appointment was amply justified by the very considerable economies he effected.

Mr. Christian Barman, F.R.I.B.A., has been appointed Publicity Officer, London Passenger Transport Board, and will be responsible for the preparation and publication of all posters, maps, leaflets, and press advertisements of the board and for all signs and notices. He will also be responsible for matters connected with the general appearance of the board's properties and for the review and design of incidental equipment. Until his present appointment Mr. Barman was engaged

Mr. Christian Barman,
Appointed Publicity Officer, London Passenger Transport Board.

in private practice as an architect. He received his professional training at the Liverpool University School of Architecture, and from there went on to work in two or three well-known offices. He founded the monthly review *Architecture*, which he continued to edit for three years. Since then he has edited other architectural papers, and has written several books on architectural subjects.

Lt.-Col. J. H. M. Greenly, C.B.E., Deputy Chairman of Babcock & Wilcox, Limited, was elected Chairman of the Coal-burning Appliance Makers Association (C.A.M.A.) at its second annual general meeting in London on March 28.

We regret to learn of the death, on March 30, of Mr. H. F. Clayton, the manufacturer of the Clayton fog-signalling machine and the inventor of the detonator placer, an arrangement by which fog-signals are placed on the track by means of a lever in the locking frame. Mr. Clayton was also the founder of Karrier Motors Limited, the

XUM

Exterior of an L.N.E.R. camping coach

Above: *The day compartment of a Southern Railway camping coach*

Right: *The sleeping compartments of a G.W.R. camping coach*

Below: *An L.M.S.R. caravan coach in a delightful rural setting*

well known commercial vehicle manufacturers and now a component of the Humber-Hillman-Commer-Karrier combine. He was perhaps best known as a racehorse owner.

Mr. F. Dawson, one of the Joint Estate Agents to the London Passenger Transport Board, has retired and Mr. F. C. Buller has been appointed Estate Agent in charge of the whole of the work of the Estates Department of the board.

As notified in the *London Gazette* of April 2, Lt. Col. L. Manton, D.S.O., O.B.E., R.E., on completion of four years' service as Regimental Lt. Col. —commanding the Royal Engineers' Railway Training Centre, Longmoor— has been placed on the half pay list as from April 1. From the same date also his promotion to Colonel is gazetted, with seniority from July 1, 1930.

G.W.R. Appointments

The following appointments are announced by the Great Western Railway:—

Mr. F. H. D. Page, Assistant to Signal Engineer, Reading; to be Assistant Signal Engineer, Reading. To date from May 1.

Mr. H. Jeanes, Chief Parcels Clerk, Cardiff General station; to be Stationmaster, Swansea High Street. To date from March 25.

Mr. D. Nicholas, Stationmaster, Pembrey & Burry Port; to be Yard Master, Llanelly Docks. To date from January 21.

Mr. S. Y. Richards, Chief Clerk, Llanelly Goods Depot; to be Chief Clerk, Swansea Goods Depot. To date from December 17.

We regret to record the death, on March 29, of Mr. C. B. O. Clarke, Chairman of the Barranquilla Railway & Pier and the Manila Railroad Companies, and a Director of the Powell Duffryn Steam Coal and other colliery companies.

Indian Railway Staff Changes

Mr. R. C. Case, Deputy Agent (Organisation), G.I.P.R., has been granted 12 months' leave as from January 10, and Mr. R. V. Hitchcock, Deputy Chief Engineer, has been appointed to officiate for him.

Mr. J. H. Fanshawe has been appointed to officiate as Deputy Chief Engineer (Maintenance), G.I.P.R., as from January 10.

Mr. J. H. Shiels has been appointed Traction Superintendent, G.I.P.R., as from February 11.

Rai Bahadur Mathra Das and Mr. F. D'Souza have been confirmed as Directors, Railway Board, as from February 3, 1933, and June 29, 1934, respectively.

Mr. L. H. Swain has been appointed Assistant Chief Controller, Standardisation, Central Standards Office, Railway Board, as from February 13.

Camping Coaches on the British Railways

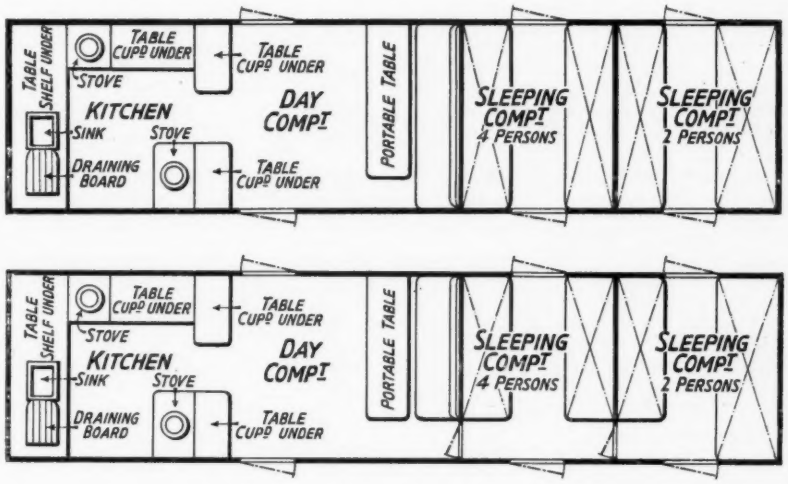
Over 200 available this summer

The example of the L.N.E.R., which first introduced camping coaches in 1933, has now been followed by the other three group railways. Both the G.W.R. and the L.M.S.R. camping coaches made their debut last summer, but the Southern Railway is offering these facilities for the first time this year. The most careful consideration has been given in selecting the sites for these coaches so as to provide for the diversity of interests of holiday-makers.

L.N.E.R.

The L.N.E.R. is equipping 30 additional coaches, so that 65 will be available for camping holidays this year. The new coaches will be of an improved type, with interior communication between the compartments. An attractive colour scheme is being adopted for the outside decoration, while additions to the equipment and a number of minor improvements have been made to all camping coaches, each of which will accommodate six people. The charge is to be £2 10s. a week for the existing coaches and £3 a week for the new and improved type of coach. The coaches will be available from Easter onwards, and special terms will be in operation for the Easter period. There will be a wide choice of sites in the most attractive coastal and inland districts on the L.N.E.R. Every coach is fully equipped with crockery, bed and table linen, table ware, kitchen equipment and a cooking stove.

A novelty this year will be the touring camping coach which is to start from York every Saturday afternoon and visit a different place every day for a week. The weekly rate for this coach including travelling to the principal beauty spots in Yorkshire will be £15 or £20, according to the season, accommodation being provided for 6 or 7 people. Further accommodation for campers has been provided at certain stations where rooms have been equipped on similar lines to the camping coaches to provide holiday accommodation. The number of people who can be accommodated in these camping compartments varies from 2 to 6. The rate for an apartment for 6 people is £3 3s. per week, with correspondingly lower charges for the more limited accommodation.

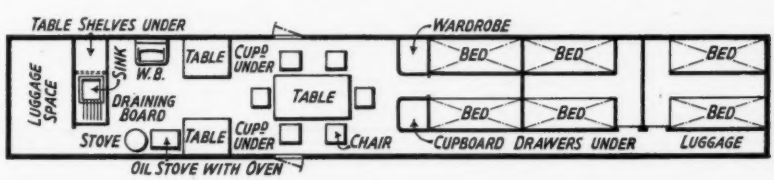


Plans of old and new type L.N.E.R. camping coaches

L.M.S.R.

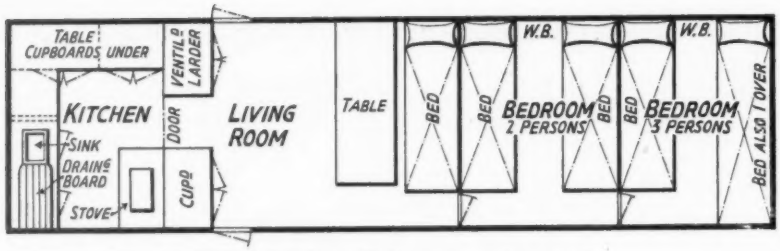
The L.M.S.R. has decided to build 58 more of its caravan coaches for service during the 1935 holiday season. This is a result of the popularity enjoyed by this facility during 1934, when 42 caravan coaches were situated at suitable places on the L.M.S.R. system.

These caravan coaches are provided



Plan of L.M.S.R. caravan coach

XUM



Plan of Southern Railway camping coach

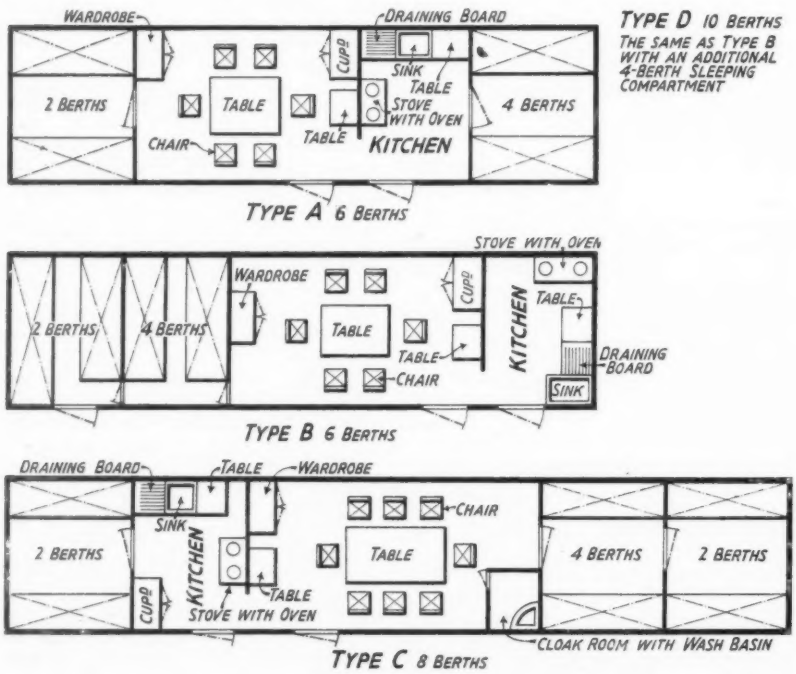
with a dining and living room, a kitchen, and three bedrooms, each accommodating two persons in full-length beds which are fixed lengthwise and not across the coach. There is ample baggage accommodation, the kitchen is fully equipped, and all bed and table linen, crockery and cutlery is supplied. The charge is £3 10s. a week during the months of July, August, and September for caravans in England, Wales, and Scotland, and £2 10s. throughout the season in Ireland. The out-season charge for caravans, other than those in Ireland, is £3 a week. The lessee has to agree in addition to book not fewer than four monthly return tickets.

G.W.R.

The number of G.W.R. camping coaches has been increased this year from 19 to 38. They provide accommodation for six, eight, or ten persons, and are let at a weekly rental of £3, £4, and £5 respectively. Equipped with cutlery, crockery, bed-clothes, kitchen utensils, linen, oil-lamps, mirrors, and deck-chairs, they include everything the modern camper may need. The coaches have been redesigned since last year and are similar to a modern bungalow, in which the sleeping compartments communicate direct with the living room and also with the kitchen, thus avoiding the necessity of going outside the coach to get from one room to another.

Southern Railway

The Southern Railway camping coaches are the first to be provided with wireless aerial and water tanks. Their equipment provides for every conceivable contingency. Even an alarum clock has been included. The coaches, which number 12 in all, are divided into three separate compartments comprising a living room, a compact kitchen, and sleeping accommodation for six people. Wash basins are fitted in the sleeping compartments. The inclusive charge for a coach is £2 10s. a week from April 1 to June 30, and £3 10s. from July 1 to September 30. The only condition is that not fewer than four monthly return tickets to the site where the particular coach is berthed are purchased.



Plans of various types of G.W.R. camping coaches

The Silver Jubilee Express, L.N.E.R.

The Silver Jubilee year of His Majesty's reign is to be fittingly commemorated by the London & North Eastern Railway. Beginning on October 1, this company will introduce a new high speed service between King's Cross and Newcastle-on-Tyne, operated by a steam locomotive and a train of articulated stock which will be fully streamlined throughout. Leaving Newcastle at 10 a.m., the Silver Jubilee will be due in London at 2 p.m.; the return journey will be commenced at 5.30 p.m. (an hour already made popular for Teesside and Tyneside travellers by the existing 5.30 p.m. express, of which the starting time will be altered), and Newcastle will be reached at 9.30 p.m. Experience on the experimental run of March 5 having shown that, even with existing locomotives and stock, a 4-hr. timing to and from Newcastle still left ample margin in reserve, the new express is to include in its run a stop at Darlington for the benefit of passengers to and from Middlesbrough, Stockton, and Hartlepool. The overall speed of the express will be 67·1 m.p.h., but the start-to-stop average over the 232·3 miles between King's Cross and Darlington, including the severe slacks through Peterborough, Selby, and York, will be in the region of 70 m.p.h. Middlesbrough and Stockton will also be reached, by connection, in roughly 4 hr. from London. New rolling stock of a special design will be built for the service—which explains why it is not possible to introduce the train immediately—and seating will be provided for 194 passengers, both first-class and third-class, with full restaurant car accommodation. This, roughly, is double the accommodation of the Flying Hamburger, which, moreover, provides meals from a cold buffet only. Ordinary ticket-holders will be carried, but in view of the special nature of the service, a small supplementary charge will be made. It is emphasised that the train is of an experimental type, and will be used to determine the extent of the public demand for facilities of this nature. The service will run from Mondays to Fridays inclusive, but not on Saturdays.

THE RAILWAY CLUB.—This club held its annual general meeting recently at the Royal Scottish Corporation Hall, Fetter Lane, London, E.C. 4. The adoption of the annual report and financial statement was carried unanimously, and was followed by the election of officers and executive committee for the ensuing year. At the conclusion of the formal business Mr. Kenneth Brown gave his presidential address, taking for his subject "The Eastern Counties Railway." The address was illustrated by an excellent series of lantern slides taken from contemporary illustrations.

Railway Benevolent Institution Annual Dinner

Mr. Robert Holland-Martin, C.B., Chairman of the Southern Railway, presided at the seventy-seventh anniversary dinner of the Railway Benevolent Institution, which was held on Tuesday, April 2, at the Connaught Rooms, London. For the third year ladies were present, and the speeches were curtailed in number in view of dancing which followed.

The list of donations and subscriptions for this year amounts to £11,716, and is as follows :—

	£
Chairman's list :	
His Majesty the King (annual subscription)	100
Other contributions	2,329
Collected and contributed by the Chief Officers and Staff of the following companies :—	
Southern Railway :	
Sir Herbert A. Walker, K.C.B. ...	517
London Midland & Scottish Railway :	
Sir Josiah Stamp, G.C.B., G.B.E., D.Sc.	2,474
Great Southern Railway :	
Mr. P. J. Floyd	2,105
London & North Eastern Railway :	
Sir Ralph L. Wedgwood, C.B., C.M.G.	2,009
Great Western Railway :	
Sir James Milne, C.S.I.	1,557
London Passenger Transport Board :	
Mr. H. S. Chapman	188
Cheshire Lines Committee :	
Mr. G. Leedam...	174
Westinghouse Brake & Signal Co. Ltd. :	
Mr. J. Griffith Hall	134
Midland & Great Northern Railways Joint Committee :	
Mr. R. B. Walker	77
Railway Signal Co. Ltd. :	
Mr. W. S. Roberts	32
Other collections	20

Among those present were :—

Mr. G. H. Loftus Allen, Mr. W. Anthony, Mr. E. Baker, Mr. G. Ballance, Mr. W. A. Ballard, Mr. H. Barnden, Mr. F. Stanton Barnes, Mr. K. W. Barter, Mr. T. Barty, Capt. L. A. M. Bates, Mr. Robert Bentley, Mr. A. P. Bevan, Mr. W. Bishop, Mr. H. J. Bourn, Mr. Leslie Boyce, M.P., Mr. T. E. Brain, Mr. J. Bromley, Sir Henry P. Burt, Mr. F. Bushrod, Mr. R. F. Bushrod.

Mr. J. Calder, Mr. A. Campbell, Mr. Raymond Carpmael, Mr. C. Carslake, Mr. F. L. Castle, Mr. J. Cave, Mr. Chas. Cooper, Sir George L. Courthope, Mr. C. H. Cowtan, Mr. E. C. Cox, Mr. A. L. Crewe, Mr. C. H. Crewe, Mr. O. Cromwell, Mr. J. Dallmeyer, Mr. R. G. Davidson, Mr. Ashton Davies, Mr. G. Cole Deacon, Mr. W. J. Devenish, Mr. C. B. Dixon, Mr. F. Downes, Mr. James Doyle, Mr. G. W. Duncan, Mr. A. Durrant.

Lord Ebbisham, Mr. Alexander Eddy, Mr. C. W. Edwards, Mr. G. Ellson, Mr. K. R. Ellson, Mr. W. J. England, Mr. E. Falconer, Mr. P. J. Floyd, Mr. E. Ford, Major G. Newton Ford, Mr. J. Fredk. Gee, Mr. E. Gore-Browne, Mr. R. S. Griffiths, Mr. R. H. Hacker, Mr. J. A. Hart, Sir Harold Hartley, Mr. H. Harvey, Mr. C. A. F. Hastilow, Col. Frank Hilder, Mr. F. J. Hills, Mr. R. Hiscock, Mr. C. G. Holland-Martin, Mr. A. Howie, Mr. A. J. Howie, Mr. A. G. Hunt, Mr. W. H. Hyde.

Mr. T. W. Jacobs, Mr. W. A. Jepson, Mr. W. S. Johnson, Mr. A. D. Jones, Mr. J. A. Kay, Mr. T. J. Kiernan, Mr. Robert Killin, Mr. J. King, Mr. A. E. Kirkus, Mr. D. R. Lamb, Mr. A. P. Lambert, Mr. L. J. Le Clair, Mr. E. F. E. Livesey, Mr. R. J. R. Loxdale, Mr. H. Mack, Mr. H. Mansbridge, Mr. John Marchbank, Mr. K. C. Marrian, Mr. E. F. Marsh, Mr. J. McLaren, Mr. W. P. McMahon, Mr. C. F. Minett, Mr. W. F. Minnis, Mr. John C. Mitchell, Mr. Walter T. Monckton, K.C., Major C. H. Montgomery, Mr. A. E. Moore, Mr. H. Morrison, Mr. G. Morton, Mr. W. H. Morton, Mr. A. Moss, Lt.-Col. A. H. L. Mount, Mr. L. H. K. Neil, Mr. F. W. Newbatt, Mr. C. H. Newton.

Mr. F. J. Orchin, Mr. C. S. Page, Mr. L. A. Pearson, Mr. R. H. Pitts, Mr. A. G. Pollard, Mr. F. R. Potter, Mr. P. H. Price, Mr. E. Pugson, Mr. A. L. C. Purr, Mr. John Quirey, the Earl of Radnor, Mr. Bertram Reece, Mr. C. W. Reeve, Mr. E. P. Reynolds, Mr. R. M. T. Richards, Mr. C. A. Roberts, Mr. W. S. Roberts, Mr. W. Robinson.

Mr. C. J. Selway, Mr. C. Sheath, Mr. T. W. Sheldon, Mr. Alfred W. Sheldon, Mr. Philip Sheldon, Major J. H. Smeddle, Mr. R. E. Blake Smith, Mr. R. Travis Smith, Mr. T. R. Smith, Mr. J. B. Stephens, Mr. E. Stone, Sir Charles Stuart-Williams, Mr. Sandham J. Symes, Mr. G. S. Szlumper, Mr. A. W. J. Talbot, Mr. Robert A. Thom, Mr. C. H. Thompson, Mr. F. W. Tipton, Mr. T. Syme Todd, Mr. W. J. Towner, Mr. Ben Travers, Sir George Wyatt Truscott, Mr. H. Dexter Truscott Mr. P. S. Turner, Mr. Alfred Tylor, Mr. W. H Victory.

Sir Herbert A. Walker, Mr. R. B. Walke Mr. H. C. Walton, Major H. A. Watson, Mr. W. C. Wayland-Carr, Mr. H. B. Webster, Sir Ralph L. Wedgwood, Major T. Williams, Mr. W. E. O. Williams, Mr. Alex. Wilson, Mr. J. S. Wilson, Mr. G. Winterbotham, Mr. H. C. Wintle, Mr. W. V. Wood, Mr. A. Woods, Mr. Alec Young.

Mr. Walter T. Monckton, K.C., proposing the toast of " Success to the Railway Benevolent Institution," said he supposed that, in asking him to propose this toast before a mixed gathering of ladies and gentlemen, the railway companies wanted someone who could expose the delicate charms which lurked behind the Railway Freight Rebates Fund, or let them into the secrets with regard to " rooms so let out as to be capable of separate assessment," and also Abstract B. When he used to appear for the railway companies at the annual reviews of rates and charges, he once sat next to the Chairman of the Railway Rates Tribunal, and said to him, " My dear Bruce, I have sat beside you for the last half hour and I do not understand a word you have said," and he replied, " My dear boy, I do not always understand it myself ! " When the ignorant trespassed into the railway world, Mr. Monckton continued, they found friends among all classes of railway officers and servants, and it gave him great pleasure to come among his friends to plead for an Institution which looked after the officers and servants of the railway companies.

The toast was responded to by the Chairman, who said that the Institution was doing a very great work for the railwaymen of this country. There were very few among the public who did not realise what they owed to those who worked on railways. He did not need to tell his audience that railway travelling was far safer than walking or motoring on the roads, and now that they had a 30 m.p.h. limit on a large number of roads, he thought they would see a considerable number of people coming back to the railways. Mr. Holland-Martin then welcomed the presence of the General Secretaries of the three great railway trade unions in their midst, and said that it was realised by all that in the Institution they could all work together for the good of the railway interests.

Lord Ebbisham proposed the health of the Chairman, and in doing so, congratulated the Southern Railway on being so lucky as to have such a brilliant successor to its previous Chairman. He hoped that soon the enormous trolleys and trailers would be removed from the roads, and that that class of traffic would be carried on the railways.

The Chairman formally replied to the toast.

NEW CROSS-COUNTRY AIR SERVICE.—Since April 2, Crilly Airways has been operating a service on weekdays only between Bristol, Leicester, and Norwich.

BARRINGTON LIGHT RAILWAY COMPANY.—The annual general meeting of the company will be held at 47, Belvedere Road, London, S.E.1, on Thursday, April 11, to receive the directors' report and accounts for the year ended December 31, 1934, for the re-election of directors, auditors and other officers, and for the conduct of other statutory business as provided for in the Barrington Light Railway Orders, 1920 and 1924, &c. This company is controlled by Eastwoods Limited, brick manufacturer and barge owner.

P.L.M. STREAMLINED STEAM TRAIN.—The high-speed streamlined steam locomotive and train recently ordered by the P.L.M. Railway from the Bugatti firm is, we understand, to run comparative trials with the two 4,000 b.h.p. diesel-electric locomotives described in the March 22 issue of our *Diesel Railway Traction Supplement*. The boiler is to be of the high-pressure Brown-Boveri Velox type, with a continuous capacity of 12 tons of steam an hour at about 800 lb. per sq. in. pressure, and incorporates the feature of combustion under pressure. The principle of the Velox boiler was described on page 375 of our issue for March 1.

HIGH SPEED AMERICAN TRAINS.—In our issue of March 22 it was stated in error that the high-speed steam trains named the " 400 " between Chicago and the Twin Cities were operated on the Chicago, Milwaukee, St. Paul and Pacific RR. These particular trains are, of course, actually run by the Chicago & North Western RR, and are quite independent of the fast services of the Chicago, Milwaukee, St. Paul & Pacific RR., which, it will be recalled, set up the record run of July last when a 4-6-4 locomotive covered the 85 miles between Chicago and Milwaukee in 67 min. 35 sec. On the Chicago and North Western RR., the " 400 " which covers the 400 odd miles between Chicago, the Twin Cities of Minneapolis and St. Paul on a 60 m.p.h. schedule, is hauled by 4-6-2 locomotives rebuilt specially for the service. It is now announced that the " 400 " is to have half an hour cut off its time from April 28. The 85 miles between Chicago and Milwaukee will be covered in 75 min., at a start to stop speed of 68 m.p.h.

XUM

MINISTRY OF TRANSPORT ACCIDENT REPORT

Poppleton Junction, York, London & North Eastern Railway: August 6, 1934

The collision now under notice arose out of the 7.45 p.m. express from Edinburgh to King's Cross running into the 10.45 p.m. express from Newcastle to King's Cross. There were no serious personal injuries nor material damage to engines or vehicles. The scene of the accident was at the southern end of the York and Northallerton colour-light signalling.

From Colonel Woodhouse's report it appears that the light of Poppleton Junction up home signal U.1 can be seen by a driver when he is approaching U. 3. Owing to the curve, shown on the accompany sketch, the lamp of U.1, at that time, appears slightly to the left of that in U.2. The latter is a non-controlled automatic signal, which is approach-lighted, being lit up when a train passes U.3, which may be regarded as Poppleton Junction outer up home signal. As viewed from the driver's side—the right-hand—of an engine running on the up main line, the light of U.1 gradually approaches and crosses that of U.2; it is to be seen to the right of the latter after a point about 300 yd. in the rear of U.2 is passed.

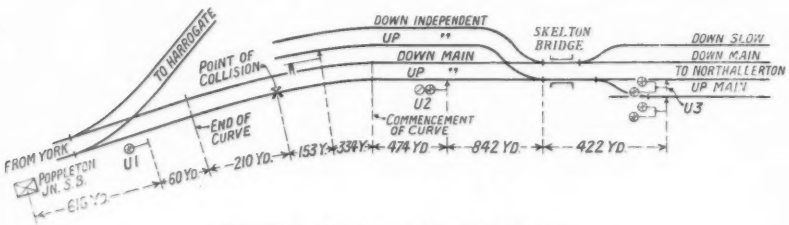


Diagram showing point of collision

The 10.45 p.m. passed Alne about 12.50 a.m., and its tail lamp was giving a good light, which the signalman there said he could see as far away as at a signal 1,200 yd. from his box. The train arrived at Poppleton Junction, and was pulled up at signal U.1 at 1.0 a.m. After a stop of three minutes the signalman changed the signal from red to yellow in order that the train might draw forward to the advanced starting signal. Just as it started to move the driver felt the shock of a collision. The driver of the 7.45 p.m., Thomas Davison, said that signal U.3 was showing yellow, both when he first saw it and when he passed it. He maintained that U.2 also was at yellow when he reached it, and at first said that he then picked up U.1 at red. Later he corrected himself, saying that he had seen the red of U.1 earlier, to the left of the yellow of U.2. He was positive that he had not mistaken the yellow of the distant for the up independent line for that of the up main line signal U.2. After passing U.2 he kept U.1 under fairly continuous observation, leaning out of the right-hand window of the cab; it remained at red all the time he was watching it. He thought that he was about 100 yd. from the 10.45 train when his fireman drew his attention to a red light that was being waved by the guard of that train, and when he first saw the tail light. He added that he had never had any difficulty in locating and identifying the new colour-light signals, which he preferred to the former semaphores.

The signals and their controls were examined and tested about four hours after the accident by Mr. J. English the Chief Signal and Telegraph Inspector. He found that with U.1 at yellow and the track circuit in rear of it short circuited, to represent a train standing at the signal, U.3 would not clear to a less restrictive aspect than yellow, and that U.2 lit up at red as soon as the track circuit immediately ahead of U.3 was occupied, remaining at red until the engine on which he was travelling passed it. With regard to the reliability of the new signals, Mr. English said that 179 of them had been installed between York and Northallerton, and that they had been in use about 18 months. During that period there had been no case of a signal sticking at yellow or at green, when it should have returned to red.

Mr. J. H. Fraser, Assistant Signal and Telegraph Engineer, stated that in the case of signals U.2 and U.3 the circuit arrangements were not such that the return to red of the former after the passage of a train was proved before the latter could clear. He pointed out, however, that if U.2 had incorrectly remained at yellow after the passage of the 10.45 train, signal U.3 would have changed from red to green, not to yellow, as soon as that train cleared the overlap beyond signal U.2.

Colonel Woodhouse says that it is clear from the evidence of the enginemen of the leading train, that the signals concerned were showing the correct sequence of aspects a few minutes before the accident—the fact that U.3 changed from yellow to green as that train was approaching it shows, too, that that signal was working properly. Moreover, very shortly after the accident, when the section ahead of it was occupied, U.2 was seen by the guard of the 7.45 p.m. train to be showing the correct aspect, namely, red. Having regard to this, and also to the statement of the enginemen of the 7.45 train that U.3 was not at green, but at yellow, when they passed it, he feels that any suggestion that U.2 failed to return from yellow to red after the passage of the earlier train is without foundation. He is, therefore, unable to accept the statement of the enginemen of the 7.45 train that U.2 was at yellow when they passed it, and is accordingly of opinion that the accident was caused through the stop indication of that signal being disregarded.

As U.1 probably remained at yellow for some time after being cleared for the 10.45 train, which was slow in starting, it is possible that it was seen displaying that aspect by the enginemen of the 7.45 train as they approached U.3, and before U.2 lit up.

Colonel Woodhouse therefore thought it advisable to view the signals concerned by night, and the company arranged a demonstration accordingly. There was average visibility at the time and he found that though the yellow of U.1 could be clearly seen when approaching U.3, it was faint, and obviously a considerable distance away. When U.2 lit up, on passing U.3, its red was unmistakably closer than U.1, and on nearing it the brilliance of its light increased far more rapidly than that of the yellow of the latter. On account of the gentle curve mentioned earlier, the full beam of U.1 was not entered until U.2 had been reached. Therefore, even if Davison had made the initial mistake referred to, it is difficult to understand how he did not realise the position as he drew nearer to U.2. Colonel Woodhouse can only assume that, after mentally registering what he took to be the indications of the next two signals ahead, his attention relaxed, and he failed to observe U.2 when he passed it. This assumption would also account for his failure to notice the tail light of the train in front until too late to stop clear of it.

JOURNAL OF APPLIED MECHANICS.—The Applied Mechanics Division of the American Society of Mechanical Engineers, has begun regular publication of a *Journal of Applied Mechanics*, under the technical editorship of Mr. J. M. Lessells, Swarthmore, Pa., U.S.A. The journal is to appear four times a year in issues containing about eighty pages each. It will consist of original papers in general mechanics, elasticity, hydrodynamics, aerodynamics, strength of materials and thermodynamics, similar to those published during the last few years in the Transactions of the Applied Mechanics Division of the Society. The annual subscription price to non-members of the society, is $5·00, payable to the American Society of Mechanical Engineers, Applied Mechanics Journal Fund, 29, West 39th Street, New York, N.Y., U.S.A.

RAILWAY AND OTHER MEETINGS

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

The annual general meeting of Associated Electrical Industries Limited was held at Bush House, Aldwych, yesterday (April 4), Sir Felix J. C. Pole, Chairman of the company, presiding.

The Secretary, Mr. R. H. Haviland, read the notice convening the meeting and the auditors' report.

The Chairman, in moving the adoption of the report and accounts, remarked that at the last annual meeting he had said that, so far as the trade outlook in the immediate future was concerned, he could speak most hopefully. The report of the directors and statement of accounts now amply justified that forecast. The 6 per cent. dividend on the ordinary stock, which would be submitted for confirmation, was double the amount paid twelve months ago. The total issued capital and debentures remained the same as last year. On the debit side credits, loans, reserves, &c., and on the assets side sundry debtors and stocks, showed considerable variation compared with the previous year, due to the increased activities of the company. The general reserve fund had been increased to £900,000 by the addition of £10,289 transferred from the Profit and Loss Account.

Share and debenture holding in subsidiary companies and amounts owing by them had decreased £17,325, and sundry investments, including British Government and Dominions securities, and cash in hand had increased £437,921.

After deducting interest on debentures £41,454, depreciation £90,439, and income tax £129,752, there was a balance left on profit and loss account of £325,237, to which had to be added the amount brought forward from the previous year, viz., £102,615, making the total profit available for distribution £427,852. Deducting dividends on preference stock and the allocation to general reserve already referred to, there was a balance of £341,114. Out of this the directors recommend payment of a dividend on the ordinary stock at the rate of 6 per cent. per annum, less income tax, leaving a balance to be carried forward amounting to £113,336, an increase of £10,721.

Total capital and debentures as shown by the consolidated balance sheet amounted to £8,802,435, of which £1,613,845, or 18·3 per cent., was held by share and debenture holders in subsidiary companies. It would be seen from the report that next July the whole of the debenture stock of Associated Electrical Industries Limited would be redeemed. The British Thomson-Houston Co. Ltd. was also redeeming its 4½ per cent. debentures, so that in a few months time the whole of the debentures held outside the group would have disappeared. This would not involve the issue of stock, it being the intention to repay the debentures out of liquid resources.

The trading results reflected the improved conditions which prevailed during the year. The output from the various factories of the group was greater than in recent years, and orders received during the year, as well as orders in hand at December 31 last, were considerably larger than those for 1933. At home, the principal orders received were from the Manchester Corporation and the Belfast Corporation for large turbo-alternator sets, and from the Fulham Corporation for two 75,000 kVA. transformers, which would be the largest they had yet manufactured, each weighing 110 tons. The London Passenger Transport Board was now experimenting with a six-coach train fitted with the company's special Metadyne system of regenerative braking. The Southern Railway had also ordered some additional rolling stock equipment.

The largest volume of overseas business came from South Africa. The Victoria Falls & Transvaal Power Company ordered four 33,000 kW. turbo-alternator sets and a 20,000 kVA. synchronous condenser, which was the fifth condenser they had supplied to that customer. From various South African mines orders were received for a large number of winding equipments. Russia, however, had given only a few small orders, due to the fact that the Russian Government was not placing orders abroad for electrical gear.

Of work actually completed in the factories last year, reference should be made to the 105,000 kW. turbo-alternator set for the Battersea Power Station of the London Power Company, and the large order for induction motors of a special design for electric locomotives for the Hungarian State Railways. These locomotives were proving to be entirely satisfactory in service. Good progress was made with traction apparatus for the Polish State Railway electrification under the contract which was reported last year.

Orders received during the first three months of this year had been appreciably higher than for the same period last year, including electric locomotives for South Africa, and water-wheel alternators of the largest diameter ever built by the company, for New Zealand. Much publicity had also been given to the contract for the electrification of a section of the Central Railway of Brazil. After a protracted period of negotiation following acceptance of the Metropolitan-Vickers Electrical Company's tender, the contract had been signed by the Minister of Transport, and had that week reached the final stage of registration by the Tribunal of Accounts. Since his visit to South America some years ago, H.R.H. the Prince of Wales had displayed marked interest in trade with South American countries, and they were indebted to him for his aid in securing this very important order. The Chairman was sure the shareholders would wish him to express publicly their most grateful thanks to His Royal Highness. Their thanks were also due to the Export Credits Department of the Board of Trade, without whose assistance the company could not have undertaken the contract.

Employment in the factories of the group was on a substantially higher level than during the past two or three years. The latest statistics showed that they now had over 30,000 employees, whereas twelve months ago the number was approximately 26,000. The directors were very pleased last October to restore the cut in salaries which had been in force for three years. To one and all of the officers, staff and employees, the Chairman wished to express grateful thanks for another year's most efficient and loyal service.

Among the points of general interest was the fact that last year the consumption of electricity in this country reached record dimensions, there having been an increase over 1933 of 1,897 million units, or 14 per cent. The striking feature of this increase was that it was almost equal to the total consumption of electricity in the year 1913. To meet the prospective demand on the power stations of the grid system the Central Electricity Board authorised the purchase of additional plant and he anticipated a steady, regular placing of orders, in view of the fact that the use of electricity was bound to go on increasing not only in factories, but also in houses, and for the many requirements of agriculture and horticulture. Moreover, the day could not be far distant when, in the interest of safety, arterial roads would be lighted throughout with electric discharge lamps. Last, but by no means least, the electrification of all suburban railways in and around London and other large cities could not be postponed indefinitely. All over the country the companies of the A.E.I. group would be carrying out floodlighting schemes in connection with the Royal Jubilee.

Although the Chairman believed there would be a continuance of good trade, the fact must not be overlooked that in many countries conditions were still unstable, and that quotas, barter agreements, exchange restrictions, &c., must inevitably impede export business. They must be thankful, therefore, that they had a satisfactory volume of orders in hand, and that the dimensions of incoming business during 1935 would maintain a good load on the factories.

The report and accounts were unanimously adopted, and the proceedings terminated with the re-election of the auditors and of three directors who had retired by rotation.

XUM

Future Indian Railway Administration

The House of Commons in Committee on April 1 discussed those clauses of the Government of India Bill which relate to railways in India. Briefly put, the essential features of those clauses may be indicated thus:—The executive authority of the Federation of India (which is constituted by an earlier part of the Bill) in respect of the construction, maintenance, and operation of railways in India shall be exercised by a Federal Railway Authority. This Executive Authority shall, in relation to railways operated by railway companies under contracts with the Secretary of State in Council, extend to the exercise of all such powers in relation to construction, maintenance, and operation as were hitherto exercisable by the Secretary of State in Council or the Governor General in Council. Not less than three-sevenths of the members of the Authority shall be appointed by the Governor General. The details as to the appointment of members of the Authority are given in the eighth schedule of the Bill. At the head of the executive staff of the Authority is to be a Chief Commissioner of Railways appointed by the Authority, subject to confirmation by the Governor General. While consideration of the schedule will come at a later stage of the Bill, the clause now discussed also says that the Authority is to act on business principles in regard to revenue and expenditure, and it is to establish a railway fund. The Governor General may appoint a Railway Rates Committee to give advice to the Authority. There is also a saving clause for certain existing rights of railway companies.

A number of amendments were moved, but for the most part they were negatived. They related to the constitution of the Authority. Some changes were, however, made on the motion of Sir Samuel Hoare, Secretary of State for India, who is in charge of the Bill. On his proposal an addition was made to clause 175 providing that the Federal Government shall perform such functions for procuring safety on the railways as in the opinion of that Government should be performed by persons independent of the authority managing the railway administration. He said that it would probably be the view of most members that questions of safety ought to be taken out of the control of the body which was principally interested in running the railways on business lines and making a good return on the railway capital. That being so, his amendment would make the Federal Government responsible for safety, just as the home Government was responsible for safety on the railways here. In India no doubt the Federal Ministry of Communications would be responsible. At a later stage of the Bill he would make a proposal to extend the powers of a tribunal to be constituted for settling disputes between rival railway interests so as to cover all the railways whether owned by the Princes or in British India.

Further statements by Sir Samuel Hoare may be indicated. On a Labour amendment regarding the composition of the Railway Authority, Sir Samuel said that the Government view was that the railways should be managed as a business undertaking, and that they should be kept as free as possible from political interference. The Indian States would be fully represented on the Authority. On a proposal by a Unionist member to increase the proportion of the persons appointed by the Governor-General from three-sevenths to four-sevenths, Sir Samuel Hoare said the men appointed were bound down by a number of conditions. Then there was to be the executive officer of the Federal railways or Chief Commissioner, who would be the General Manager of the system. This key-man was to be appointed by the Governor-General,* and that fact disposed of many of the suspicions of hon. members. The broad policy as to the percentage of the various sections of the population employed by the railways would be laid down, and would be only alterable after the Governor-General had given his assent.

Considerable discussion took place on an amendment moved by Mr. H. Williams to clause 177 (directions and principles to be observed by the Railway Authority) declaring it to be the duty of the Authority so far as reasonable to ensure that plant, goods, and material required for the railways shall have been produced within the British empire and under fair conditions of labour.

Sir Samuel Hoare said that for many years the Government of India had been allowed to place its contracts for railway material where it desired. Inquiries showed that 75 per cent. of the orders had come to Great Britain. The Government of India had acted without official intervention from Whitehall, and no doubt had based its decisions on the merits of the goods. It would therefore be a mistake to attempt to go back on that policy and to impose on India by statute a policy of preference.

After speeches by Mr. Churchill and others in favour of the amendment, Sir S. Hoare said that those hon. members who thought that the Government was taking no precautions for the future seemed to have forgotten that they were now considering the setting up of a Railway Board to be run on business lines independent of political interference. The Bill contained safeguards of various kinds as to business principles. As to the wording of the amendment, it was so vague that no one would be able to carry it into effect, and that the certain reaction that it would have on opinion in India would be to excite suspicion and make the Railway Board much less likely to give orders to British firms than otherwise. The immediate effect would be to make Indian opinion mobilise itself in favour of restricting orders to Indian firms. Under the amendment it would be feasible for the Federal Board to give all its orders to Indian firms.

The amendment was negatived by 221 votes to 41.

Consideration of the railway clauses was concluded. This subject is also dealt with editorially on page 632.

* He will be appointed by the Authority subject to confirmation by the Governor General.

Questions in Parliament

Chinese Railway Reorganisation

Mr. Moreing on April 1 asked the Secretary of State for Foreign Affairs whether he could give the House any information with regard to the proposed appointment of Brigadier-General Hammond and two other British railway experts to examine the organisation of the Chinese railway system and to advise the Chinese Government thereon.

Sir John Simon.—Brigadier-General F. D. Hammond, accompanied by Mr. L. J. L. Lean and Mr. F. J. M. Taylor, both of the Great Western Railway, is leaving on April 4 for China, where he will probably remain approximately four months in order to examine and advise upon the reorganisation of the Chinese railway system. His appointment was the result of an entirely spontaneous invitation from the Chinese Government, and his mission represents an independent technical inquiry with no political associations.

PERFECTOL NOW MADE IN ENGLAND.—Perfectol car cleaner, which is used for cleaning railway and road transport vehicles, and has hitherto been manufactured in America, is now being made in England. The firm of Henry W. Peabody & Co., of London, Ltd., which for the past 30 years has handled Perfectol for home and export trade, has now opened a factory in London, and manufacture has already begun.

BRANCKER MEMORIAL LECTURE.—The Council of the Institute of Transport has arranged to hold, so far as practicable, an annual open lecture on air transport, in memory of the late Air Vice-Marshal Sir Sefton Brancker, K.C.B. He became a member of the Institute in 1922, served on the Council from 1923 to 1926, was a Vice-President 1927-28, and President 1928-29. The establishment of this lecture has been made possible by the co-operation of the donors of the Institute Aerial Transport Medal in agreeing to the utilisation for the purpose of certain surplus funds standing to the credit of the premium.

Is the Pedestal on which Competition has been Enthroned Tottering?

Under the presidency of Sir Lynden Macassey, Mr. W. L. Hichens, a Director of the L.M.S.R., read a paper with the above title to the Railway Students' Association on March 21. The principle of competition, said Mr. Hichens, was the keystone of the vast industrial development of the nineteenth century. Had it not been for the strong individualism of the 18th and 19th centuries, a product of the reformation and the growth of puritanism, our industrial progress would have been much slower. In those days the right of the individual to make whatever he liked and to sell at any price that suited him was not disputed. Had a national transportation board with a monopoly of public transport been in existence in the early years of last century, the pioneer organisations which built railways all over the world might not have developed.

The circumstances of the 19th century, however, no longer held, and Britain was no longer the workshop of the world. The competitive system required for its success a continuous expansion of demand. It could take care of production so long as distribution could be left to look after itself. Now that our consumptive capacity no longer kept pace with the productive side, might not some other form of industrial organisation be advisable?

Believers in the competitive system had often questioned it, that is, they had been inclined to think that it should apply to all industries but their own. Before the war there were instances of price fixing associations, but these existed more or less on sufferance. Workers as well as employers sought to evade the competitive principle. Briefly, whilst in the Victorian days the general public and Parliament worshipped at the shrine of the competitive principle, there were many who openly revolted. Since the war the spirit of revolt had spread rapidly. No longer were combines disapproved in principle. Price fixing by collective action was now generally favoured, but the competitive principle should not be lightly cast away. Great public services like the railways, the Central Electricity Board, and the Post Office could, he thought, be run most efficiently as monopolies, but the fact of their being monopolies carried with it the obligation that their profits should be limited. The railways, of course, were not strictly monopolies because of motor competition, and Mr. Hichens did not think that a centralised public transport board would be in the general interest. While there were certain fields for monopolies, we could not hold our own in the markets of the world unless the most free rein was given to individual enterprise. Yet we were moving steadily in the opposite direction in company with the whole civilised world. Russia set the fashion of planning with its Five Year Plan. Mussolini, Hitler, and Roosevelt had followed suit, and the industrial reorganisation laws of France, Belgium, and Japan were tarred with the same brush. He hoped Great Britain would keep out of this world movement.

The strong and influential group now at work to popularise what they called planning wanted in each industry a National Industrial Council with wide statutory powers of control. There was also to be a Federal Industrial Council with representatives from each National Industrial Council empowered to settle inter-industrial problems. In this way industrial self government would replace the present confusion with order and prosperity. For his part Mr. Hichens thought this would establish a highly objectionable form of dyarchy, and he preferred that any compulsory powers necessary should be exercised through Parliament and not through a body of industrial experts. The preliminary step consisted in an Enabling Act to authorise a 75 per cent. majority on any Industrial Council to impose its will. Such an Act presupposed that every industry was encased in a watertight compartment of its own, whereas in reality our industries could not be separated from the whole of which they formed part.

In a static world a demarcation of industries might be possible, but where new methods and inventions constantly succeeded one another an elastic organisation was essential. The gravest objection to planning was that it struck at the root of individual liberty. He would be sorry for anyone who had to run the gauntlet of, say, a National Steel Federation before being allowed to develop some new process for the manufacture of steel.

Rationalisation, on the other hand, had the two-fold aim of cheapening costs and reducing the field of productive capacity, while at the same time endeavouring to maintain the level of wages. Improved mechanical devices and mass production had contributed to the former, whilst amalgamations and the closing down of redundant plant had effectively reduced productive capacity. As an example Mr. Hichens mentioned that 137 shipbuilding berths, with an annual capacity of 1,000,000 tons, had been permanently closed. These were better lines to follow than the planned existence, which struck at the root of individual liberty and the competitive system, the foundation stones of our vast industrial edifice. A planned state was all very well for ants and bees, but human beings were not meant to be regimented and driven through life in an orderly procession.

(*See editorial note on page* 629)

Exports of Railway Material from the U.K. in Feb.

	Feb., 1935	Feb., 1934	Two Months Ending Feb., 1935	Two Months Ending Feb., 1934
	£	£	£	£
Locomotives, rail	86,554	34,086	147,502	59,515
Carriages and wagons	67,242	30,748	154,423	88,850
Rails, steel	74,871	31,929	144,472	78,751
Wheels, sleepers, fishplates and miscellaneous materials	114,156	54,242	193,600	115,196

Locomotive and rail exports included the following :—

	Locomotives		Rails	
	Feb., 1935	Feb., 1934	Feb., 1935	Feb., 1934
	£	£	£	£
Argentina	—	—	8,004	7,836
Union of South Africa	—	—	39,557	14,744
British India	6,715	—	33,107	16,237

AMBULANCE PRESENTATION AT PADDINGTON.—The annual distribution of ambulance awards to members of the Paddington, Acton and Hayes classes was held at the Institute, Stanley Street, Paddington, on the evening of March 27, when Mr. J. F. Lean, Principal Assistant to the General Manager and Chairman of the Central Ambulance Committee, presided over a large and enthusiastic company. Among those present were Mr. A. S. Mills, District Goods Manager, Mr. F. Sealey, Hotels Department, Mrs. Lean, and Miss C. A. Ault, Centre Secretary. A large number of the Paddington No. 37 Division of the St. John Ambulance Brigade were in attendance. Mr. Lean congratulated the Paddington Division on its excellent record, and particularly the Ealing and Paddington teams, winners, respectively, of the "Ernest Palmer" and "Frank Potter" shields for advanced and beginners' teams. He particularly encouraged recruits to come forward and join the ranks, and referred in appreciative terms to the veterans who had built up the movement. Mrs. Lean then presented the competition trophies and prizes to the winning teams, and four gold medals to members of the Paddington class for 15 years' efficiency, in addition to examination awards. An enjoyable and varied musical programme was afforded by the Swindon Social and Educational Union.

XUM

NOTES AND NEWS

Railway Convalescent Homes.—The spring banquet will be held in the Wharncliffe Rooms of the Hotel Great Central, Marylebone, on Tuesday, April 16, when the chair will be taken by the President, the Right Honourable Sir Robert Horne, G.B.E., K.C., M.P.

Indian Railway Pensioners.—A conference of civil and military pensioners (including widows and orphans) of the Indian establishment has been privately arranged and will take place at Caxton Hall, Westminster, on Friday, April 12, at 3 p.m., to discuss the future security of Indian pensions. Tickets of admission may be had from Mrs. M. B. Sim, 77, Cadogan Place, S.W.1. Indian railway officers who have retired on pension are cordially invited to attend.

Another Diesel Railcar Service.—On April 1 the Great Western Railway inaugurated a new train between Birmingham and Stratford-on-Avon with one of the three A.E.C. diesel railcars which maintain the buffet service between Birmingham and Cardiff. The new supplementary service is timed to leave Birmingham (Snow Hill) at 12.25 p.m. and arrive at Stratford at 1.0 p.m. after stops at Earlswood Lakes and Henley-in-Arden. The return trip is commenced at 2.15 p.m. and Snow Hill reached at 2.50 p.m. No extra charge is being made.

Road Accidents.—The Ministry of Transport return for the week ended March 30 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding week of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England... ...	85	(97)	2,724	(3,610)
Wales	6	(10)	121	(143)
Scotland... ...	9	(13)	300	(324)
	100	(120)	3,145	(4,077)

The total fatalities for the previous week were 100, as compared with 128 for the corresponding period of last year.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of February, 1935, amounted to $8,656,000, an increase of $85,000 compared with February, 1934, and working expenses were $7,806,000, an increase of $53,000, leaving net earnings $32,000 higher, at $850,000. Aggregate gross earnings for the two months January 1 to February 28, 1935, amounted to $16,923,000, a decrease of $618,000 during the corresponding period of 1934, and the aggregate net earnings of $1,054,000 showed a falling off of $654,000.

Canadian National Earnings.—For the month of February, 1935, gross earnings of the Canadian National Railways amounted to $12,423,833, an increase of $898,616 in comparison with February, 1934. Operating expenses ($12,289,238) at the same time advanced by $39,031, leaving net earnings $859,585 higher, at $134,595. Aggregate gross earnings from January 1 to February 28, 1935, were $24,534,119, an improvement of $1,446,325 on the first two months of 1934, and there was an aggregate deficit of $609,059, contrasting with $1,533,956 for the first two months of 1934.

French Summer Time.—As summer time was introduced in France on Sunday last, March 31, but will not come into force in Great Britain until April 14, the usual interim alterations have been made in the timings of the Southern Railway cross-Channel services.

The Ottoman Railway from Smyrna to Aidin.—A Reuters report from Ankara states that an agreement for the purchase of this railway by the Turkish Government was initialled there on April 3. Reference to this proposed purchase was made by Lord St. Davids, Chairman of the company, at the recent half-yearly meeting in London, which was reported on page 624 of last week's issue.

U.S.A. Railway Rates.—The Interstate Commerce Commission, on March 30, authorised the railroads to add "emergency charges" to their rates for many types of freight traffic. The companies' application had been for an all-round increase of 10 per cent. in freight rates, which was calculated to add $170,000,000 to yearly revenue. The emergency charges, which will be effective until June 30, 1936, will add $85,000,000 to revenue. The rate increases on the specified commodities average 7 per cent.

Exhibition of Maps at L.N.E.R. Stations.—By special arrangement with the Director General of the Ordnance Survey, a copy of the appropriate one-inch ordnance survey map is being exhibited, framed and glazed, at those stations on the L.N.E.R. system which are popular with ramblers as starting points for walks. Each map bears a transparent arrow with the words "This Station" inscribed pointing to the position of the station on the map. No fewer than 170 maps have been provided for posting at a similar number of L.N.E.R. stations in 22 counties of England and Scotland.

Western Wagon Winding-up.—A meeting of the Western Wagon & Property Co. Ltd. is to be held at Bristol on April 8 to consider a resolution to wind up the company. The directors anticipate that the available assets will provide a considerable surplus after repayment of the paid up share capital, and that shareholders should receive a greater sum than is reflected in the present market value of the shares. The company was incorporated on September 30, 1881; its registered office is at Clare Street House, Bristol; and the Chairman is Mr. W. G. Verdon Smith. The wagon department has been discontinued, and it is understood that the property business consists only in the ownership and development of the land and property known as the Filton estate.

Filming the German Railways.—A special train has been fitted out to carry a small party of cameramen and other technicians who are travelling throughout Germany to film the German railways in action. The shots will form part of the film "The Steel Animal," now being made to celebrate the centenary of the German railways this year.

The Brussels Junction Railway.—The Belgian Senate, on April 3, adopted a Bill to authorise the construction of the junction line to connect the Nord and Midi stations in Brussels. A new central station will be built in the heart of the city. The State undertakes to provide fr. 300,000,000 (about £2,290,000 at current rates) towards the cost. Another Bill was adopted authorising the railway administration to raise a loan of fr. 812,000,000 (£6,151,000).

Cheap First Class Fares.—Mr. E. C. Cox, Chairman of the Railway Superintendents' Conference, discussing, in an interview, the comprehensive nature of the holiday plans which he and his colleagues are preparing, incidentally observed: "A sufficient period has not elapsed since January 1, 1935, to enable the railways to measure fully the success, or otherwise, of cheap first class fares, but from the figures available for the month of January, 1935, no less than 26,000 additional first class passengers were conveyed."

New L.M.S.R. Isle of Man Air Service.—The L.M.S.R. and the Isle of Man Steam Packet Co. Ltd. announce that they have entered into joint arrangements for the provision of air services to and from the Isle of Man. These services, which are to commence just before Easter, will be operated on behalf of the two companies by Railway Air Services Limited, and will connect at Manchester or Liverpool with the existing R.A.S. trunk route between London, Belfast and Glasgow. Connections will be made at Croydon with the Continental services radiating from that point, while, by other connections with R.A.S. services, air transport will be later available to and from the Isle of Man and the South Coast and West of England.

G.W.R. (London) Musical Society Concert.—Selections from Edward German's "A Princess of Kensington" filled the first part of the programme at the G.W.R. (London) Musical Society's annual Queen's Hall concert, held on March 29, under the chairmanship of Lord Palmer. The Swindon Choir and

Orchestra co-operated with the society in the production, and in accordance with the usual custom of enlisting the services of professional artistes, solos and duets were sung by Miss Olive Groves in the part of Kenna and by Mr. Edward Reach as Brook. The performance was enthusiastically received, and among the most popular items was the quartet, "We're four jolly sailormen," effectively sung by Messrs. N. Menzies, F. Rendall, F. Sharpe, and G. Miller. In the second half of the programme excellent entertainment was afforded by Miss Doreen Eyres-Hill, and the Western Brothers. Two madrigals by the choir and songs by Foster Richardson were other items, and to conclude the programme the orchestra and choir combined in the Kermesse scene from "Faust." The conductor was Mr. W. H. Reed, who secured a unity with the individual choirs and orchestra which was notable, particularly when it is borne in mind that only one full combined rehearsal had been held. Among the G.W.R. directors and officers present were:—

Sir Robert Horne (Chairman), the Rt. Hon. Lord Palmer (Deputy Chairman and President of the Musical Society), the Rt. Hon. the Earl of Dunraven, Sir Charles J. Hambro, Sir Henry Mather Jackson, Mr. G. F. Luttrell (directors); Messrs. R. Carpmael (Chief Engineer), C. R. Dashwood (Assistant General Manager), F.C.A. Coventry (Superintendent of Road Transport), F. R. E. Davis (Secretary), C. M. Jacobs (Signal Engineer), G. Orton, D. V. Levien, and many other officials of the Company.

Performance of Java Railway Coaches.—On January 20, 1932, a number of coaches was put into service on the Java State Railways, which covered approximately 142,600 miles up to September, 1934. This is equivalent to 95,800,000 revolutions of a wheel of 2 ft. 6 in. in diameter. The only attention which had to be given to the axleboxes, supplied by British Timken Limited, Aston, Birmingham, was lubrication, which had to be done only after periods of 3 to 5 months' service. For the period from January, 1932, to September, 1934, it has been estimated that oil consumption amounted only to just over ½ gallon a bearing.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 13th Week			Totals to Date		
	1935	1934	Inc. or Dec.	1935	1934	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,925½ mls.)						
Passenger-train traffic...	417,000	628,000	– 211,000	4,823,000	4,995,000	– 172,000
Merchandise, &c. ...	467,000	395,000	+ 72,000	5,776,000	5,772,000	+ 4,000
Coal and coke ...	235,000	233,000	+ 2,000	3,459,000	3,508,000	– 49,000
Goods-train traffic ...	702,000	628,000	+ 74,000	9,235,000	9,280,000	– 45,000
Total receipts	1,119,000	1,256,000	– 137,000	14,058,000	14,275,000	– 217,000
L.N.E.R. (6,339 mls.)						
Passenger-train traffic...	266,000	377,000	– 111,000	3,220,000	3,285,000	– 65,000
Merchandise, &c. ...	336,000	300,000	+ 36,000	4,026,000	4,111,000	– 85,000
Coal and coke ...	235,000	219,000	+ 16,000	3,165,000	3,264,000	– 99,000
Goods-train traffic ...	571,000	519,000	+ 52,000	7,191,000	7,375,000	– 184,000
Total receipts	837,000	896,000	– 59,000	10,411,000	10,660,000	– 249,000
G.W.R. (3,749¼ mls.)						
Passenger-train traffic...	164,000	257,000	– 93,000	2,020,000	2,105,000	– 85,000
Merchandise, &c. ...	188,000	161,000	+ 27,000	2,323,000	2,275,000	+ 48,000
Coal and coke ...	104,000	107,000	– 3,000	1,386,000	1,452,000	– 66,000
Goods-train traffic ...	292,000	268,000	+ 24,000	3,709,000	3,727,000	– 18,000
Total receipts	456,000	525,000	– 69,000	5,729,000	5,832,000	– 103,000
S.R. (2,172 mls.)						
Passenger-train traffic...	252,000	376,000	– 124,000	3,044,000	3,111,000	– 67,000
Merchandise, &c. ...	71,500	63,000	+ 8,500	765,000	819,500	– 54,500
Coal and coke ...	36,500	35,000	+ 1,500	458,000	495,500	– 37,500
Goods-train traffic ...	108,000	98,000	+ 10,000	1,223,000	1,315,000	– 92,000
Total receipts	360,000	474,000	– 114,000	4,267,000	4,426,000	– 159,000
Liverpool Overhead ... (6¼ mls.)	1,060	1,031	+ 29	14,134	13,957	+ 177
Mersey (4½ mls.) ...	4,113	4,399	– 286	53,042	54,562	– 1,520
*London Passenger Transport Board ...	539,100	514,700	+ 24,400	20,687,500	20,286,600	+ 400,900
IRELAND						
Belfast & C.D. pass. (80 mls.)	1,612	1,859	– 247	22,088	22,627	– 539
,, ,, goods	481	535	– 54	6,117	6,894	– 777
,, ,, total	2,093	2,394	– 301	28,205	29,521	– 1,316
Great Northern pass. (543 mls.)	7,400	9,550	– 2,150	104,100	94,950	+ 9,150
,, ,, goods	10,600	9,900	+ 700	110,050	109,900	+ 150
,, ,, total	18,000	19,450	– 1,450	214,150	204,850	+ 9,300
Great Southern pass (2,124 mls.)	20,370	24,446	– 4,076	244,616	249,091	– 4,475
,, ,, goods	39,318	33,281	+ 6,037	460,081	416,704	+ 43,377
,, ,, total	59,688	57,727	+ 1,961	704,697	665,795	+ 38,902

* 39th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes

Good Friday, 1934

British and Irish Railways Stocks and Shares

Stocks	Highest 1934	Lowest 1934	Prices Apl. 3, 1935	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	66½	48½	47½	–½
5% Con. Prefce. ...	118	109	112½	–
5% Red. Pref. (1950)	115	107	110½	–
4% Deb.	117	105	112	–
4½% Deb.	119	109	115½	–
4½% Deb.	129½	115¼	123½	–1
5% Deb.	135	126¼	135½	–1
2½% Deb.	75	64	77	–2
5% Rt. Charge ...	134⁷/₁₆	123¼	129½	–1
5% Cons. Guar. ...	132⅝	121⅝	126½	–
L.M.S.R.				
Ord.	30½	19½	18	–
4% Prefce. (1923)	64¼	41	44½	–½
4% Prefce. ...	87	69½	77½	–
5% Red. Pref. (1955)	107	92½	100½	–
4% Deb.	114⅛	100½	104	–
5% Red. Deb. (1952)	118¹¹/₁₆	111¼	116½	–
4% Guar.	106½	96⅝	99½	–½
L.N.E.R.				
5% Pref. Ord. ...	24⅝	13½	11	–
Def. Ord.	11½	6⅞	6	–
4% First Prefce. ...	76	59½	58½	–1
4% Second Prefce.	47	25½	21½	–½
5% Red. Pref. (1955)	94½	80	81½	–
4% First Guar. ...	104	92	95½	–
4% Second Guar.	97⅞	86½	87	–
3% Deb.	90	74½	77½	–½
4% Deb.	114	99¼	102½	–
5% Red. Deb. (1947)	117	108	112½*	–
4½% Sinking Fund Red. Deb.	111¼	105¼	110½	–
SOUTHERN				
Pref. Ord.	90	63⅛	82	–
Def. Ord.	32⅝	19	22	–
5% Prefce. ...	118⅝	107½	112½	–
5% Red. Pref. (1964)	115¾	107½	114½	–
5% Guar. Prefce.	132	120¾	127½	–
5% Red. Guar. Pref. (1957)	119½	113	117½	–
4% Deb.	116½	103¼	111	–
5% Deb.	134	124¹⁵/₁₆	134½	–
4% Red. Deb. 1962–67	113¹¹/₁₆	105⁹/₁₆	111½	–
BELFAST & C.D.				
Ord.	6	5	5	–
FORTH BRIDGE				
4% Deb.	110	100	109½	–
4% Guar.	110	100	109½	–
G. NORTHERN (IRELAND)				
Ord.	9¾	4¹⁵/₁₆	9	–
G. SOUTHERN (IRELAND)				
Ord.	25	12½	25	–
Prefce.	21½	13¹⁵/₁₆	26½	+½
Guar.	48	39	58¾	–¼
Deb.	67	59	73¾	–½
L.P.T.B.				
4½% "A" ...	126	115	121½	–
5% "A"	135½	124½	131½	–
4½% "T.F.A." ...	113½	107½	112	–
5% "B"	131¾	118	124½	–
"C"	97	73	97	–
MERSEY				
Ord.	15¼	7	12	–1
4% Perp. Deb. ...	93½	82½	94½	–
3% Perp. Deb. ...	66½	61½	69½	–
3% Perp. Prefce....	54	44½	52½	–

* ex dividend

XUM

CONTRACTS AND TENDERS

D. Wickham & Co. Ltd. has received an order from the Buenos Aires Central Railway for seven petrol-driven permanent-way gang trolleys.

New Stock for Metropolitan District Line, L.P.T.B.

The London Passenger Transport Board has placed orders with the Birmingham Railway Carriage & Wagon Co. Ltd. for 14 motor coaches and 14 trailer coaches for the Metropolitan-District Line. The British Thomson-Houston Co. Ltd. is to supply the electric traction equipment and the General Electric Co. Ltd. will supply the motors.

Wright Pinhorn & Partners Limited has received an order from the Indian Stores Department for a quantity of boiler and flue tubes at a total price of Rs. 29,834.

Electro Mechanics Limited has received orders from the Indian Stores Department for 2,000 2-in. diam. and 600 2½-in. diam. steel boiler tubes at a total price of Rs. 15,930.

Locomotives for India

W. G. Bagnall Limited has received an order from the Gaekwar's Baroda State Railways for three A class 4-6-0 metre-gauge tender locomotives to be exact duplicates of those described and illustrated in THE RAILWAY GAZETTE of June 23, 1933, and further illustrated in the following issue. These engines will have two outside cylinders, 15½ in. by 22 in.; coupled wheels 4 ft. diam., and weight in working order, engine only, 34·2 tons. This firm has also received an order from the same railway for two WT class narrow-gauge 0-6-4T locomotive boilers. The whole of this equipment will be supplied to the inspection of the consulting engineers, Messrs. Rendel, Palmer & Tritton.

The Superheater Co. Ltd. has received an order from the Bengal-Nagpur Railway for a quantity of superheater elements, headers and snifting valves.

The South Indian Railway Administration has placed the following orders to the inspection of Messrs. Robert White & Partners :—

Henry Pooley Limited: 12 wheel balancing machines, each with a capacity of 12-tons and for wheels up to 6 ft. 2 in. diam.

Britannia Batteries Limited: 190 alkaline train lighting cells.

Mather & Platt Limited: Four sets of train-lighting switchgear and accessories and dynamos.

Wagons for India

The Metropolitan-Cammell Carriage & Wagon Co. Ltd., has received an order from the Jodhpur Railway for 100 metre-gauge covered wagons, type MCJ., with vacuum brake gear.

John Spencer & Sons (1928) Limited has received an order from the Madras & Southern Mahratta Railway for 150 steel carriage and wagon axles to the inspection of Messrs. Rendel, Palmer & Tritton.

The Consolidated Brake & Engineering Co. Ltd. has received an order from the Bombay, Baroda & Central India Railway for 200 sets of vacuum brake fittings for narrow-gauge wagon stock to the inspection of Messrs. Rendel, Palmer & Tritton.

The Bengal & North Western Railway Administration has placed the following orders to the inspection of Messrs. Rendel, Palmer & Tritton :—Ruhrstahl A.G.: 329 locomotive tyres; and Wm. Beardmore & Co. Ltd.: 100 carriage and wagon tyres.

Wm. Beardmore & Co. Ltd. has also received an order from the Assam-Bengal Railway for 100 carriage and wagon axles.

Diesel Railcars for Norwegian State Railways

The success of the diesel-engined railcar, which has now been running a year in the Trondheim district of Norway, has led the Norwegian State Railways to order seven more Mercedes-Benz engines of the same type, says Reuters Trade Service, quoting *Handels og Sjoefartstidende*. The engines are six-cylinder 135-b.h.p. and two are installed in each car. The first car was described and illustrated in the *Diesel Traction Supplement* to our November 30, 1934, issue.

J. Baker & Bessemer Limited has received an order for 800 steel carriage tyres for the Bengal-Nagpur Railway.

Jessop & Co. Ltd. has received an order from the Indian Stores Department for 3,000 cast steel buffer cases at a total price of Rs. 26,250.

Greaves Cotton & Co. Ltd. has received an order from the Indian Stores Department for one oil-engined 50 kW generating set.

Burn & Co. Ltd. has secured orders from the Indian Stores Department for 65,000 crossing bearing plates.

Order for Anti-friction Bearings

British Timken Limited has received an order for 264 complete axleboxes for the New Zealand Government Railways. These bearings will be of the tapered roller type and are for fitting to the axles of passenger coaches. The order is understood to be the largest of its kind placed by New Zealand in this country, and follows another recently secured by this firm for more than 200 bearings for fitting to the axleboxes of locomotives and coaches on the Queensland Government Railways.

The Rohilkund & Kumaon Railway Administration has placed orders with J. Baker & Bessemer Limited for 100 carriage and wagon tyres and with the Monkbridge Iron & Steel Co. Ltd. for 102 locomotive tyres to the inspection of Messrs. Rendel, Palmer & Tritton.

A contract amounting to well over £25,000,000 between the Soviet Government and a group of French financiers and steel manufacturers for the reconstruction and modernisation of a large section of Russian railways is reported to be under discussion in Paris. Negotiations are said to be progressing rapidly, and it is thought that it will be possible for work to begin on the western stretches of the Russian railway system within the next few months.

The Ministry of Finance, Survey of Egypt, is calling for tenders, to be presented in Giza by June 15, for the supply of about 4,500 tons of light and heavy rails, new or second-hand. Firms desirous of offering goods of United Kingdom manufacture can obtain further details of this call for tenders from the Department of Overseas Trade.

The Chief Controller of Stores, Indian Stores Department, invites tenders receivable on the dates named as follow :—

For galvanised iron sheets required for the quarter commencing August 16 (April 24).

For one electrically-driven vertical spindle tube well turbine pumping set of 30,000-gall./hr. capacity against 148-ft. head (April 24).

For 1,600 mild steel dogspikes and 2,352 fishbolts and nuts (April 20).

For a total of 32 sets alkaline and 39 sets of acid train lighting cells (April 30).

For a quantity of screw couplings for broad gauge rolling-stock required for year commencing September 17 (April 30).

Forthcoming Events

Apr. 5 (*Fri.*).—Institute of Transport (Leeds), at Town Hall, 6.30 p.m. Annual General Meeting.

Institute of Transport (Nottingham Graduate), at Guildhall, 7 p.m. Annual General Meeting.

Institution of Civil Engineers (Glasgow Students), at Inst. of Engineers and Shipbuilders, 7.30 p.m. "The Development of Modern Bridge Design," by Mr. T. W. Brown.

Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 7 p.m. Informal Meeting.

Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Railway Stations and Architecture," by Mr. R. M. Robbins.

Apr. 8 (*Mon.*).—Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. "The Road and Rail Traffic Act, 1933," by Mr. J. S. Nicholl.

Stephenson Locomotive Society, at King's Cross Station, L.N.E.R., London, N.1, 6.30 p.m. "The Production of a Locomotive from Preliminary Schemes to the Trial Run," by Mr. E. Forge.

Apr. 9 (*Tues.*).—Institute of Transport (Birmingham), at Queen's Hotel, 6 p.m. Annual General Meeting.

Permanent Way Institution (Sheffield), at Royal Victoria Hotel, 7 p.m. "The Relationship between Signal and Permanent Way Maintenance," by Mr. J. H. Fraser.

Apr. 10 (*Wed.*).—Institution of Railway Signal Engineers, at L.M.S.R. Signalling School, Hunts Bank, Manchester, 6 p.m. "Economic Aspects of Railway Signalling," by Mr. A. J. Pearson.

Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. Informal Meeting. The Economic Outlook for Engineering.

Permanent Way Institution (London), at L.M.S.R. Dining Club, Euston Station, 7 p.m. "Principles to be Aimed at by Length Gangers," by Mr. H. Williams; "Changing Points and Crossings," by Mr. A. Carn.

Apr. 11 (*Thurs.*).—Institute of Metals (London), at Society of Motor Manufacturers, 83, Pall Mall, S.W.1, 7.30 p.m. Annual General Meeting.

Permanent Way Institution (Brighton), at Lecture Room, New England Street, 7 p.m. "Electrification Extension to Eastbourne," by Mr. Knotts.

OFFICIAL NOTICES

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of :—

1. STEEL BARS, PLATES, SHEETS, &c.
2. METALS.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders, addressed to the Chairman and Directors of the South Indian Railway Co. Ltd., marked "Tender for Steel Bars, Plates, Sheets, &c.," or as the case may be, with the name of the firm tendering, must be left with the undersigned not later than 12 noon on Thursday, the 18th April, 1935, in respect of Specification No. 1 and not later than 10 a.m. on Friday, the 12th April, in respect of Specification No. 2.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 10s. for each copy of each Specification.

A. MUIRHEAD,
Managing Director.

91, Petty France,
Westminster, S.W.1.
3rd April, 1935.

RAILWAY TURNTABLE, 13 ft. 9 in. dia., standard gauge, new or secondhand, wanted.—Write, giving full particulars, Box 295, SELLS LIMITED, 14, Lancaster Place, W.C.2.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada), 146A, Queen Victoria Street, London, E.C.4. 49 years' references. 'Phone City 6161.

RAILWAY AND OTHER REPORTS

Taltal Railway Co. Ltd.—The board has declared an interim dividend of 1s. a share, less income tax, on account of the year ending June 30, 1935, payable to holders registered on April 16 next.

Bolivia Railway Company.—The net earnings for the half-year ended December 31, 1934, are sufficient to pay interest of 0·899 per cent. on the 5 per cent. mortgage and collateral trust income bonds. The balance required to enable interest of 1½ per cent. (6s. per £20 bond) to be paid has been provided by the Antofagasta Railway Company.

East Kent Light Railways Company.—The report for the year 1934 shows railway receipts of £10,710 (against £11,379 in 1933), and net receipts of £1,403 (against £1,556). Net miscellaneous receipts of £998 bring the total of net revenue to £2,401, a decrease of £200. Liability for debenture interest is met by a payment equal to £2 per cent., leaving £23 (against £161) to be carried forward.

Madras & Southern Mahratta Railway Co. Ltd.—The Secretary of State for India in Council has informed the company of his intention to exercise his option and redeem the whole of the 4 per cent. debenture stock, 1936, at par, on April 1, 1936. As from that date interest on the debenture stock in question will cease to be payable. Repayment will be made by the company, by whom information as to the procedure to be followed will be issued in due course.

Oldham, Ashton-under-Lyne & Guide Bridge Junction Railway Company.—Gross receipts for the year ended December 31, 1934, were £20,324, against £20,041 in 1933. Expenditure decreased by £890 to £25,860. Adding receipts from miscellaneous sources, and deducting charges, the net revenue showed a deficit of £4,053, compared with one of £5,185, but the amounts receivable under lease from the L.M.S.R. and L.N.E.R. left a balance available for dividends of £1,900. Ordinary first-class passengers fell off in numbers from 2,323 to 1,461, and ordinary third-class from 431,767 to 425,959, but there were 40,487 more workmen travellers, so that the total number carried, excluding seasons, increased from 668,067 to 701,884.

Glamorgan Wagon Co. Ltd.—The report of this Cardiff company for the year ended November 30, 1934, shows a profit of £2,839 (against £2,028 for the previous year). After adding £3,925 brought in and £500 tax reserve not required, making £7,265, and deducting £3,000 special expenditure on wagons, there is left £4,265 to be carried forward.

Buenos Aires Central Railroad and Terminal.—Gross receipts for the year ended June 30 last in Argentine paper pesos were down by $306,420 to $3,544,911. Expenses decreased by $7,587, leaving a net operating revenue of $392,047. Deducting this figure from the debit balance of $5,232,668 brought forward from the preceding year, and from a further $5,566,651 represented by renewals reserve, &c., left a debit balance on the year of $10,406,779.

Grand Union Canal Company.—For the year ended December 31, 1934, the gross receipts amount to £239,151 and the working expenses to £171,014. Working expenses show a considerable increase, due to pumping necessitated by the abnormal drought. Net revenue is £88,047. After interest on the debenture stocks and other charges have been met, there remains the sum of £16,123 to which has been added £12,491 brought forward from last year, and £6,355 credit adjustment in respect of the period prior to 1933, making a total of £34,969. The dividend on the 6 per cent. preference stock for the year amounted to £24,000, leaving a balance of £10,969, which is carried forward.

Northern General Transport Co. Ltd.—The surplus of revenue over expenditure for the year ended July 31, 1934, amounted to £160,778, compared with £149,145 in .933, total revenue being £570,312, as against £554,448, and expenditure increasing from £405,303 to £409,535. A provision of £63,000 has again been made for renewals, and from the balance the directors recommend the payment of a further 3¼ per cent. on the preference shares, making a dividend of 6½ per cent. for the year, and of 10 per cent. on the ordinary shares (in respect of which 4 per cent. has been paid). The balance of £37,717 to be carried forward compares with one of £31,187. The company is controlled jointly by the L.N.E.R. and the British Electric Traction Co. Ltd.

Swedish Ball-Bearing Company (S.K.F.).—The net profit for 1934 of £867,589 compared with £487,092 in 1933. Depreciation totalled £250,160. A sum of £278,351 was allocated to the payment of taxes and will cover all requirements up to and including the past year. A dividend of 8 per cent., as in 1933, is recommended on coupon No. 24, while it is proposed to allot against coupon No. 25 one share in Aktiebolaget Volvo, a subsidiary carrying on the manufacture of motor cars and lorries, for every five S.K.F. shares.

Southport and Cheshire Lines Extension Railway.—Gross receipts for the year ended December 31 last were down by £65 at £19,219, and expenditure fell from £11,800 to £11,758. A balance of £7,461 carried to net revenue account showed a decline of £23 compared with the corresponding figure last year. After payment of the debenture interest, £2,898 remained on net revenue account, compared with £2,675 last year, out of which the directors recommend a payment of 2 per cent. on the 2½ per cent. preference stock. A sum of £1,398 will be carried forward, as against £1,175 last year.

English Steel Corporation Limited.—The trading profit for the year ended December 31, 1934, was £498,908, compared with £176,039. After deducting £63,270 for interest on debenture stock and other charges, the net profit of £435,638 showed an improvement of £316,503. Appropriation for debenture stock sinking fund was £10,383; loss on buildings and plant dismantled during works reconstruction amounted to £46,363; and depreciation for the year was £120,000. Deducting these sums from the net profit, together with a debit balance of £241,773 from the previous year, left £17,120 to be carried forward. During the year a subsidiary company, Industrial Steels Limited, was placed in voluntary liquidation and its assets merged with those of the corporation. A new company with the same name has been formed to carry on trading.

XUM

Railway Share Market

The stock and share markets have been steady, notwithstanding the general uncertainty of the European political situation, the devaluation of the belga and the nervousness of investors in gold currency countries.

Home railway stocks continued to attract attention from investors who take the view that domestic conditions are preferable to those existing in foreign countries which influence the position of foreign railway stocks. This accounts for the relative steadiness of quotations of home railway stocks in the face of the depressing publication on Wednesday of the traffic receipts for the past week. It is realised, of course, by the Stock Exchange and most investors that the big decreases shown are due to comparison with substantial increases in the pre-Easter holiday week of last year. Nevertheless, the broadcasting of big decreases in the aggregate since the commencement of the year in gross traffic receipts tends to bring about a nervousness among small holders of railway stock which is considered in many brokerage firms to be contrary to the best interests of the companies. In some quarters it is even being suggested that it would be preferable that the traffic figures should not be published rather than they should appear in their present gross form comparing with periods of railway travel of a year ago under wholly different circumstances. Passenger revenue for the third week of March compared, for example, with an important race week a year ago in the North, and the fourth week's receipts issued on Wednesday go against the Easter holiday period of 1934. Making allowance for these differences it is contended that the trend of traffic receipts of the four railways is not unfavourable and does not justify the heavy depreciation of Stock Exchange prices compared with this time last year. L.M.S. ordinary then stood at 28 against 18 this week, Great Western ordinary at 59 as against 48, L. & N.E. preferred ordinary at 21 as against 11 and Southern deferred at 30 as against 22.

Foreign railways were dull. Cordoba Central first debenture stock was the only exception, buying of this stock being induced by possible completion of reported negotiations for the sale of the railway to the Argentine Government. Canadian Pacific common fell on Belgian sales.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1934-35	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1934	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1934	Prices: Lowest 1934	Prices: Apl. 3, 1935	Yield % (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	830	31.3.35	13,350	— 1,610	13	158,710	167,590	— 8,880	Ord. Stk.	26⅝	19	16½	Nil
	Argentine North Eastern	753	30.3.35	7,924	+ 1,201	39	282,406	323,285	— 40,879	,,	11	6⅞	7	Nil
	Argentine Transandine	111	—	—	—	—	—	—	—	A. Deb.	52	45	40	10
	Bolivar	174	Feb., 1935	6,600	+ 200	8	12,450	12,950	— 500	6 p.c. Deb.	10	6½	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	30⅝	10 7/16	13	31 5/16
	Buenos Ayres & Pacific	2,806	30.3.35	101,597	+ 7,410	39	2,937,513	3,294,706	— 357,193	Ord. Stk.	16½	8½	6	Nil
	Buenos Ayres Central	190	17.3.35	$92,000	+ $16,800	37	$4,117,900	$4,053,800	+ $64,100	Mt. Deb.	23	10	21½	Nil
	Buenos Ayres Gt. Southern	5,085	30.3.35	181,431	+ 34,103	39	5,627,569	5,279,825	— 652,256	Ord. Stk.	35	22	22	Nil
	Buenos Ayres Western	1,930	30.3.35	53,223	— 7,317	39	1,726,901	2,045,804	— 318,902	,,	27½	18½	18	Nil
	Central Argentine	3,700	30.3.35	128,652	+ 17,715	39	4,607,326	5,179,342	— 572,016	,,	23	13½	14	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	14	7	8	Nil
	Cent. Uruguay of M. Video	273	30.3.35	11,360	— 2,946	39	551,023	638,522	— 87,499	Ord. Stk.	15½	8	7½	Nil
	Do. Eastern Extn.	311	30.3.35	2,114	— 1,055	39	74,417	128,193	— 53,776	—	—	—	—	—
	Do. Northern Extn.	185	30.3.35	1,321	— 649	39	40,889	69,855	— 28,966	—	—	—	—	—
	Do. Western Extn.	211	30.3.35	550	— 1,234	39	30,893	63,894	— 33,001	—	—	—	—	—
	Cordoba Central	1,218	30.3.35	25,070	+ 2,870	39	1,106,220	1,319,820	— 213,600	Ord. Inc.	6	3	3	Nil
	Costa Rica	188	Jan., 1935	16,816	+ 2,798	30	115,867	128,984	— 13,117	Stk.	30⅝	23½	31½	6⅝
	Dorada	70	Feb., 1935	11,000	+ 700	8	21,500	22,000	— 500	1 Mt. Db.	103	95	104½	5½
	Entre Rios	810	30.3.35	12,466	+ 3,652	39	485,684	491,279	— 5,595	Ord. Stk.	21½	12	11	Nil
	Great Western of Brazil	1,082	30.3.35	8,000	+ 700	13	135,700	129,900	+ 5,800	Ord. Sh.	7⅛	3⅛	1/2	Nil
	International of Cl. Amer.	794	Feb., 1935	$409,078	— $100,563	8	$838,555	$970,374	— $131,819	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/-	1/-	1/2	Nil
	La Guaira & Caracas	22⅜	Feb., 1935	3,400	+ 220	8	6,500	7,580	— 1,080	Stk.	12⅝	7⅝	8½	Nil
	Leopoldina	1,918	30.3.35	28,441	+ 2,540	13	307,480	301,054	+ 6,426	Ord. Stk.	14⅝	7	5	Nil
	Mexican	483	21.3.35	$229,100	— $24,100	11	$2,648,900	$2,486,300	+ $162,600	,,	3¼	1½	1½	Nil
	Midland of Uruguay	319	Feb., 1935	10,768	+ 1,455	34	89,883	77,993	+ 11,890	,,	1½	1/2	1½	Nil
	Nitrate	401	30.3.35	4,627	— 7,320	13	35,118	48,605	— 13,487	Ord. Sh.	32 9/32	51/-	2¼	Nil
	Paraguay Central	274	30.3.35	7,400	+ 4,110	39	194,030	124,920	+ 69,110	Pr. Li. Stk.	84	67	65	9¼
	Peruvian Corporation	1,059	Feb., 1935	62,821	+ 11,289	34	499,646	439,952	+ 59,694	Pref.	14½	8	7½	Nil
	Salvador	100	23.3.35	¢39,600	— ¢900	38	¢761,502	¢767,183	— ¢5,681	Pr. Li. Db.	75	70	70	7⅛
	San Paulo	153½	24.3.35	35,805	+ 5,043	12	391,342	368,271	+ 23,071	Ord. Stk.	86	67	61	6 9/16
	Taltal	164	Feb., 1935	4,161	+ 1,341	34	20,831	18,412	+ 2,419	Ord. Sh.	2⅛	1 7/16	1⅝	6⅛
	United of Havana	1,365	30.3.35	40,554	— 11,219	39	901,906	712,200	+ 189,706	Ord. Stk.	6	2	3	Nil
	Uruguay Northern	73	Feb., 1935	1,012	— 74	34	9,458	9,391	+ 67	Deb. Stk.	6¼	3	4½	Nil
Canada.	Canadian National	23,735	21.3.35	628,224	+ 10,553	11	6,784,811	6,497,669	+ 287,142	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	78¼	51½	66½	6
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104½	97¼	101½	3 15/16
	Canadian Pacific	17,211	21.3.35	427,000	— 16,600	11	4,700,600	4,843,600	— 143,000	Ord. Stk.	18 5/16	11 1/16	11	Nil
India.†	Assam Bengal	1,329	2.3.35	29,415	— 2,912	48	1,313,284	1,166,331	+ 146,953	Ord. Stk.	88½	72	81½	3 11/16
	Barsi Light	202	9.3.35	1,665	— 480	49	128,820	139,072	— 10,252	Ord. Sh.	104½	98⅝	102½	5⅞
	Bengal & North Western	2,113	16.3.35	56,739	+ 571	24	1,243,172	1,133,446	+ 109,726	Ord. Stk.	29 7/16	26 2	29 3/16	5 9/16
	Bengal Dooars & Extension	161	9.3.35	2,419	+ 275	49	146,432	143,029	+ 3,403	,,	125¼	124	124½	5⅝
	Bengal-Nagpur	3,269	2.3.35	125,625	— 3,967	48	5,480,463	5,099,097	+ 381,366	,,	105½	96	102½	3⅞
	Bombay, Baroda & Cl. India	3,072	23.3.35	155,025	— 21,450	51	8,119,725	7,828,050	+ 291,675	,,	115	108½	114½	5¼
	Madras & South'n Mahratta	3,230	2.3.35	107,925	— 17,208	48	5,113,767	5,224,046	— 110,279	,,	131	122⅝	126½	7½
	Rohilkund & Kumaon	572	16.3.35	13,074	— 1,248	24	255,788	244,560	+ 11,228	,,	263	250	283½	5⅝
	South India	2,526	9.3.35	78,164	+ 4,863	49	3,886,394	3,775,183	+ 111,211	,,	119	115	116	6⅞
Various.	Beira-Umtali	204	Jan., 1935	64,519	+ 19,077	17	245,504	194,466	+ 51,038	—	—	—	—	—
	Bilbao River & Cantabrian	15	Feb., 1935	2,061	+ 365	8	4,310	3,243	+ 1,067	—	—	—	—	—
	Egyptian Delta	621	10.3.35	6,108	— 152	49	228,250	224,049	+ 4,201	Prf. Sh.	21 5/16	13¼	17⅝	5⅝
	Great Southern of Spain	104	23.3.35	2,127	— 163	12	22,284	25,996	— 3,712	Inc. Deb.	4	3½	3½	Nil
	Kenya & Uganda	1,625	Jan., 1935	239,686	+ 47,245	4	239,686	192,441	+ 47,245	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50	33	45½	7 11/16
	Mashonaland	913	Jan., 1935	121,793	+ 39,115	17	464,048	359,731	+ 104,317	1 Mg. Db.	101	91¾	102	4⅞
	Midland of W. Australia	277	Jan., 1935	13,177	— 2,178	30	99,124	95,750	+ 3,374	Inc. Deb.	100	93	96½	5 3/16
	Nigerian	1,905	9.2.35	54,495	+ 6,089	45	1,727,105	1,540,871	+ 186,234	—	—	—	—	—
	Rhodesia	1,538	Jan., 1935	194 575	+ 45,831	17	751,227	614,138	+ 137,089	4 p . Db.	104⅞	97½	105	3 15/16
	South African	13,217	9.3.35	546,497	+ 66,403	49	25,379,662	22,330,842	+ 3,048 820	—	—	—	—	—
	Victorian	6,172	Dec., 1934	870,315	+ 101,872	26	4,751,974	4,536,635	+ 215,339	—	—	—	—	—
	Zafra & Huelva	112	Feb., 1935	10,521	+ 175	8	21,904	23.255	— 1,351	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador receipts are in currency

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rate of exchange and not on the par value

Electric Railway Traction

Southern Electrification Figures

ONCE again Sir Herbert Walker has come forward with telling figures regarding the electrification of the Southern Railway lines, this time in an article on railway electrification which he has contributed to *Electricity*, a supplement to *The Financial News* for March 25. Commenting upon the possibility of operating economically a much more frequent service with electricity than with steam, Sir Herbert stated that on the Southern Railway in 1934 the electric train-miles amounted to 26,000,000, whereas the displaced steam services totalled only 10,000,000 train-miles. Electrified sections therefore cost more to operate than the steam sections they displace, though, of course, much less per train-mile, and the case for electrification is greatly strengthened if it can increase the receipts during the non-rush hours. The electrification of the Southern has certainly proved that this can be done, and Sir Herbert considers that it is in these relatively slack periods that the profits are made.

The cost of electrifying the 360-odd route miles on the Southern has been approximately £12,000,000, but the increase in the gross receipts has been most impressive. In 1934 the passenger receipts on the electrified sections were £6,211,374, representing an increase of £1,850,000 on the revenue for the last year of steam operation. On the other hand the working costs increased by only £164,000 (including allowances for repairs and for the maintenance of track equipment and rolling stock), so that the net increase in revenue was about £1,680,000. Even if the whole cost of electrification had been charged to capital expenditure, the results would still have been eminently satisfactory, but actually only £5,000,000 were charged to that account and £5,000,000 to the rolling stock renewal funds. Had steam operation continued, heavy annual expenditure would have been necessary for the renewal of locomotives, so that some of the cost of electrification may be regarded as normal replacements. The number of passengers carried on the electrified sections in 1934 was 242,400,000, an increase of 11,000,000 over the previous year, and on the Brighton division the number increased from 1,900,000 in 1932 (the last pre-electric year) to 2,500,000 in 1933 and to more than 2,600,000 in 1934. Moreover, the total number of passenger journeys on the Southern is now in excess of the total for the peak year of 1929. These figures certainly show the success of one of the main reasons of electrification, viz., to obtain more traffic.

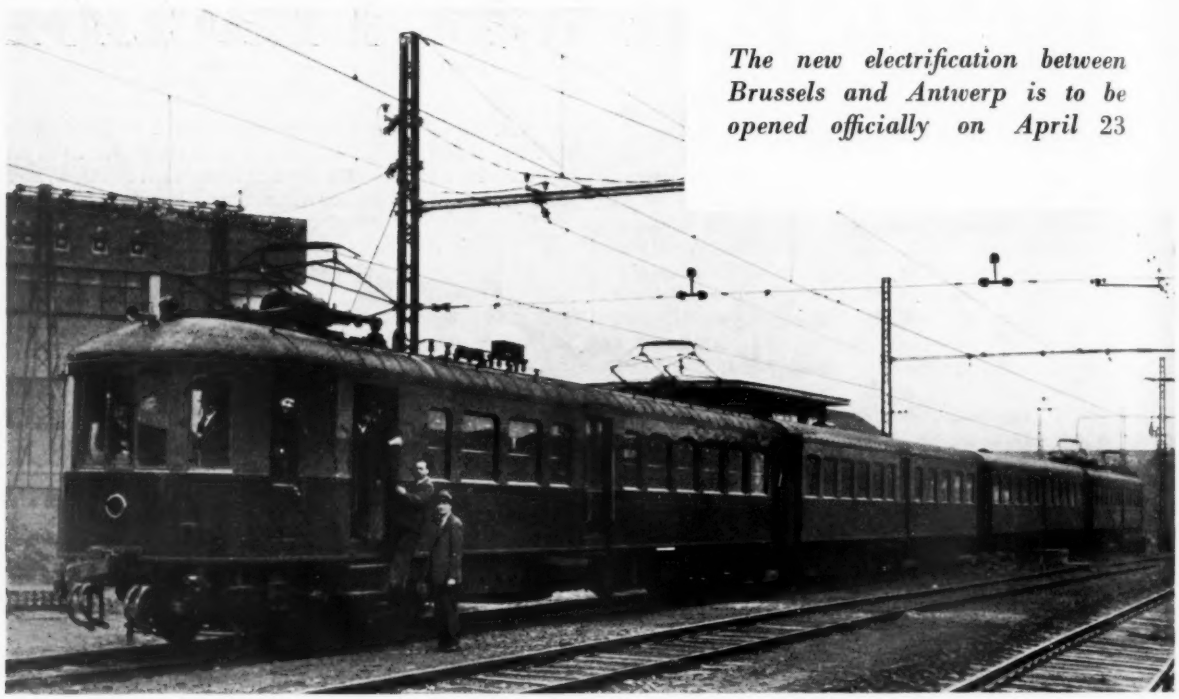
In view of the assumptions made in the Weir Report concerning current consumption and cost, the experience of the Southern Railway is of particular interest. The Weir Committee assumed that the cost of current, one of the most important single factors, would be 0·50d. per unit delivered to the track. During 1934 the Southern used 403,600,000 kWh. at a cost of 0·384d. *delivered to the substations*, but the cost of converting it from high-tension a.c. to low tension d.c. in the 67 substations concerned, raised the price to approximately 0·577d. per unit at the track. This is 15 per cent. above the Weir Report figure, and of itself brings down the 6·7 per cent. profit calculated by that Committee to 5·8 per cent. But the subject does not end there. The Southern obtains its power from three sources, its own power station at Durnsford Road, Wimbledon; the London Power Company's station at Deptford; and the grid at Croydon, Three Bridges and Brighton. The current consumption and cost from the three supplies in 1934 was as follows: Durnsford Road, 121,372,000 kWh. at 0·329d. per unit and at a load factor of 40·1 per cent.; London Power Company, 237,396,400 kWh. at 0·39d. per unit and at a load factor of 40·6 per cent.; the grid, 44,831,040 kWh. at just over 0·50d. per unit and at a load factor of 31·7 per cent. With a national electrified system, or even with a greater current demand and increased load factor, it should be possible to reduce the cost of current below the unit figure assumed in the Weir Report.

Brussels-Antwerp Electrification

ALTHOUGH possessing few, if any, outstanding features, the electrified line between Brussels and Antwerp is an example of thoroughly modern high-tension d.c. equipment. Perhaps the most surprising feature at first sight is the fact that only a fast interurban service will be operated as from April 23, the opening date, and that the suburban traffic out of Brussels and Antwerp will continue to be steam worked. At the moment, the rush-hour traffic of these cities is by no means great, and can easily be handled by the present means, but future developments have not been neglected and the electric line has been provided with stations corresponding to most of those on the adjacent steam section. During the day there is to be a service of three trains an hour, and a ten-minute service for a short time at peak periods. With the timetables which are to be followed from the inauguration on April 23, the yearly train-mileage will be approximately 1,350,000, and the estimated current consumption for all purposes (traction, station lighting, signals, &c.) is 15,000,000 kWh. There are several operating and technical points of interest which differ from English practice. For instance, the new electric service is being inaugurated on a Tuesday compared with the Sunday openings of the Southern Railway extensions, but this is mainly on account of the preceding week-end being the Easter holiday. Naturally, the Belgian authorities will not risk inaugurating electric traction on a day of abnormal traffic during a holiday period. A further point of difference compared with Southern railway practice is that the incoming high-tension lines to the substations are owned by the power supply companies, and not by the railway. Another method of creating railway traffic and revenue was discovered by the Belgian National Railways during the electrification. The work required the construction of a big embankment at Malines, and as all the material for this could not be obtained from the cuttings, it was necessary to excavate the necessary filling from a site nearby. Water rose in the excavations from some underground source, and with commendable promptitude this was turned into a pleasure lake complete with boats and beer halls, and a substantial traffic has been developed.

XUM

FIRST BELGIAN MAIN-LINE ELECTRIC RAILWAY

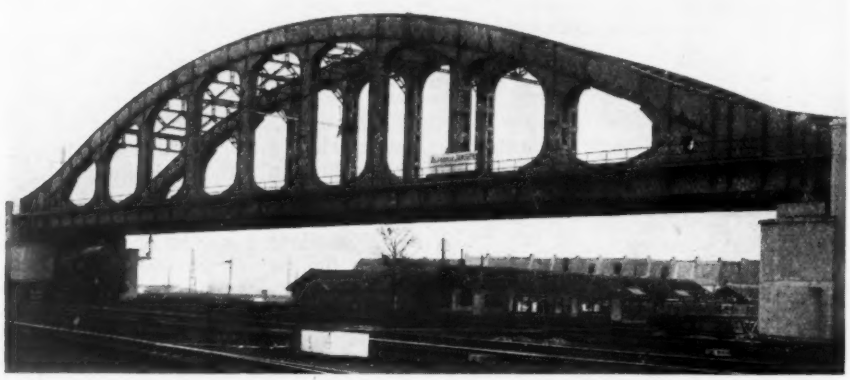


The new electrification between Brussels and Antwerp is to be opened officially on April 23

Four-car 3,000-volt d.c. electric train as used on the new electric railway between Brussels and Antwerp on the Belgian National Railways system

ONE of the most important electrification schemes on the Continent in recent times is that of the Belgian National Railways between Brussels and Antwerp, public service over which is to be inaugurated on April 23. As may be seen from the map accompanying this article, the new line runs from the Nord station at Brussels to the Central station at Antwerp, and closely parallels the existing steam line. Although the distance between the termini is only 44 km. (27·4 miles) it is not intended at the moment to run anything but a fast interurban service with certain trains stopping at Malines. The suburban traffic out of both Brussels and Antwerp is still to be worked by steam trains, but future electric suburban services seem to be foreshadowed by the double stations at such places as Eppeghem, Weerde, and Contich.

The electrified lines, which are partly new construction, are double throughout, and the track mileage amounts to 90 km. (56 miles). The rails are in 18 m. (59 ft.) lengths weighing 50 kg. per m. (100 lb. per yd.); the maximum grade is 0·9 per cent. (1 in 111) and the sharpest curve 800 m. (2,610 ft.) radius. The principal civil engineering works necessary were the elimination of 20 level crossings, and the erection of large steel bridges near Schaerbeek and Malines. The level crossings were replaced by ten over-

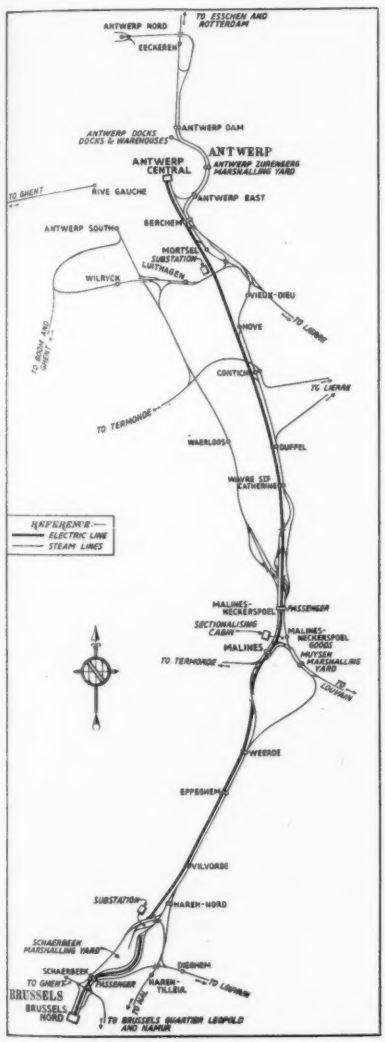


Steel bridge spanning the steam lines to the north of Malines station, Belgian National Railways

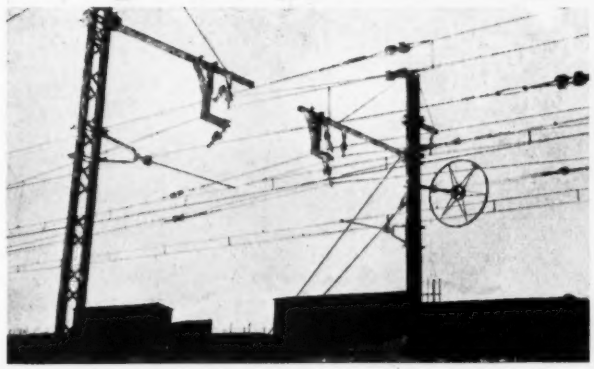
bridges, four underbridges, and three footbridges. The bridge near Schaerbeek has a span of 93 m. (304 ft.) and carries the railway over the lines and road to Louvain. At Malines are two bridges, the first (north of the station) carrying the electric lines over the steam track, (as shown in one of the accompanying illustrations), and the second, with a span of 65 m. (213 ft.) carrying the line over the canal with a headway of 7 m. (22 ft. 10 in.). The approaches to this bridge are along embankments, the material for which was taken from the cutting between Hove and Berchem which had to be excavated to eliminate the level crossings. The embankment on the northern side extends through Malines, where two new platforms for electric trains have been built at a higher level than the steam station. South of Malines the material for the new embankment was dug out of adjacent land which gradually filled with water and is now used as a lake for pleasure purposes. Four tracks at the eastern side of Brussels (Nord) station and three tracks at Antwerp (Central) are equipped for handling electric trains.

Power supply and distribution

The power required for the electrified lines is supplied by the Schaerbeek power station of the Interbrabant company, and by the Antwerp plant of the Centrale de Schelle de l'Interescaut. The former delivers 11 kV. 50-cycle three-phase current to Haren substation, and the latter 15 kV. 50-cycle three-phase current to the Mortsel substation. These are the only substations on the line, the wide spacing being possible by reason of the 3,000-volt direct current which is used in the contact wire. The high-tension current is received into the substations through three 1,880 kVA., 3/6 phase oil-cooled transformers, which, contrary to British practice, are located under cover. They are mounted on rollers so that a complete unit, weighing 22 tons, can be removed when desired; in the event of an explosion or other untoward incident, the oil in the transformer can be dropped into a trough and led away to an underground tank.



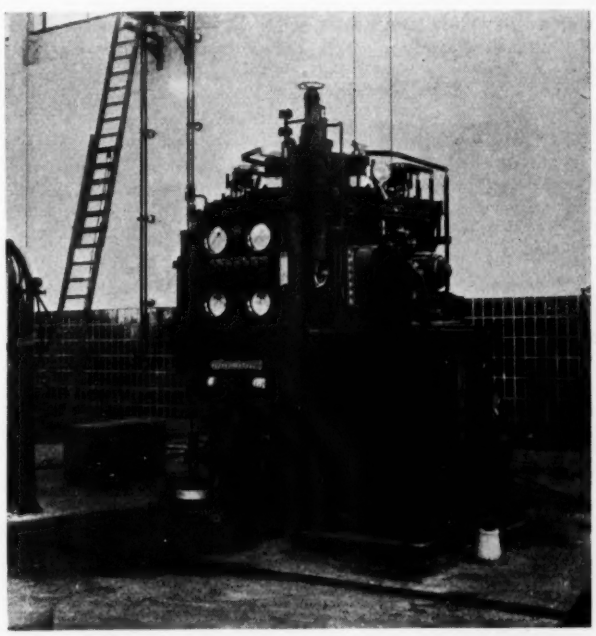
Map of Brussels-Antwerp lines



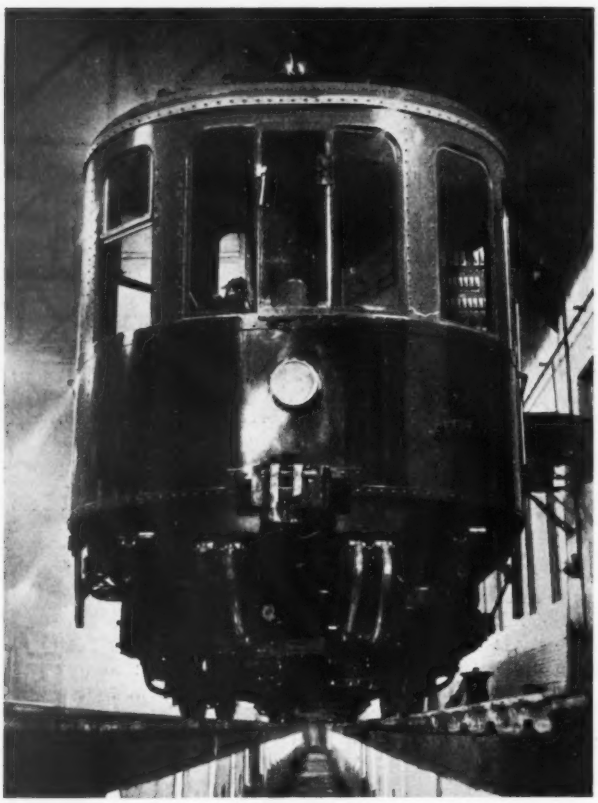
Tension-adjusting device for overhead lines, Belgian National Railways

From the transformers the current is led in six-phase form to metal-clad mercury-arc rectifiers, of which there are three in each substation. The rated capacity of a rectifier is 1,500 kW. (3,000 volts 500 amp.), and the overload capacity is 1,850 amp. for 45 sec. The rectifiers at Mortsel substation are fitted with polarisation grids, and together with the remainder of the substation equipment were made by the Soc. d'Electricité et de Mécanique, (S.E.M.), whereas the apparatus at Haren substation was built by the Ateliers de Constructions Electriques de Charleroi (A.C.E.C.).

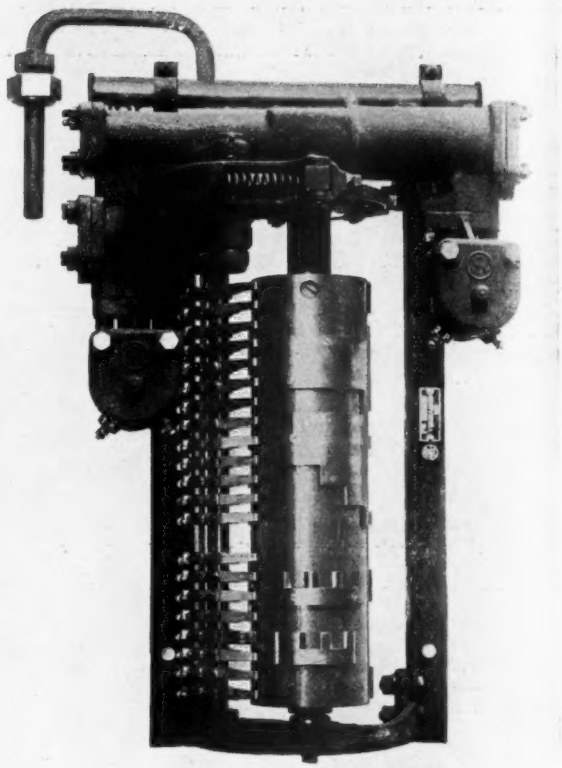
A compound catenary system is used for the suspension of the overhead contact lines, and comprises a main catenary cable of 94 sq. mm. (0·15 sq. in.) cross section and an auxiliary catenary of 72 sq. mm. (0·115 sq. in.) area. There are two contact wires above each track with an aggregate area of 100 sq. mm. (0·16 sq. in.), and they



A.C.E.C. 1,500 kW. mercury-arc rectifier in Haren substation



End view of a motor-coach on the Belgian National Railways

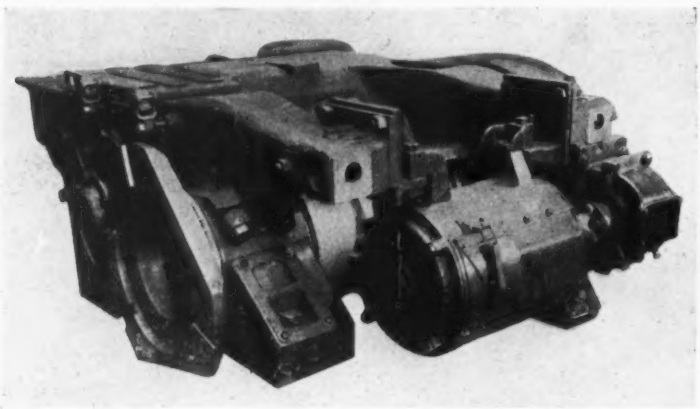


Electro-pneumatic controller as used on the 820 h.p. motor-coaches

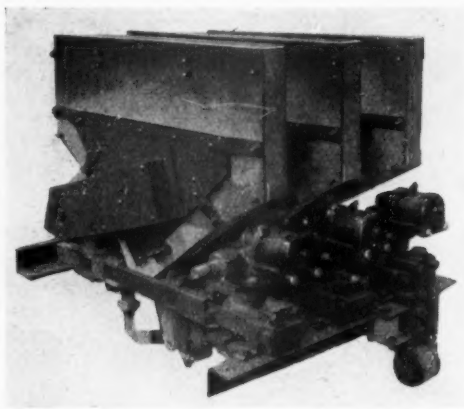
are kept at a constant tension of 1,000 kg. (2,204 lb.) by counterweights. The tension in the catenaries is 1,235 kg. (2,730 lb.). Out on the line the masts and suspension system for each track are independent; in general, the masts are of welded steel lattice construction, but on certain sections of the line concrete posts are being tried.

Rolling Stock

The rolling stock consists of 12 four-car steel trains, each comprised of two motor-coaches and two trailers with a total seating capacity of 116 second class and 243 third class. Both motor-coaches and trailers have an overall length of 22·15 m. (73 ft.), a breadth of 2·835 m. (9 ft. 4 in.), and a bogie pitch of 14·85 m. (48 ft. 8 in.). The driving bogies have 1·118 m. (43-in.) wheels spread over a base of 2·85 m. (9 ft. 4½ in.), and the trailer bogies 1·010 m. (39·75-in.) wheels spread over a base of 2·3 m. (7 ft. 6½ in.). The axles of all bogies run in S.K.F. roller bearings. Each motor-coach weighs 71 tonnes and each trailer 44 tonnes, the total weight of a four-car train seating 359 passengers being 230 tonnes. The maximum permissible speed in normal service is 120 km.p.h. (74·6 m.p.h.);



205 *h.p.* 1,500-*volt traction motor, with the low tension auxiliary generator which is driven from the axle*



View of the main circuit-breaker as used in the Brussels-Antwerp motor-coaches

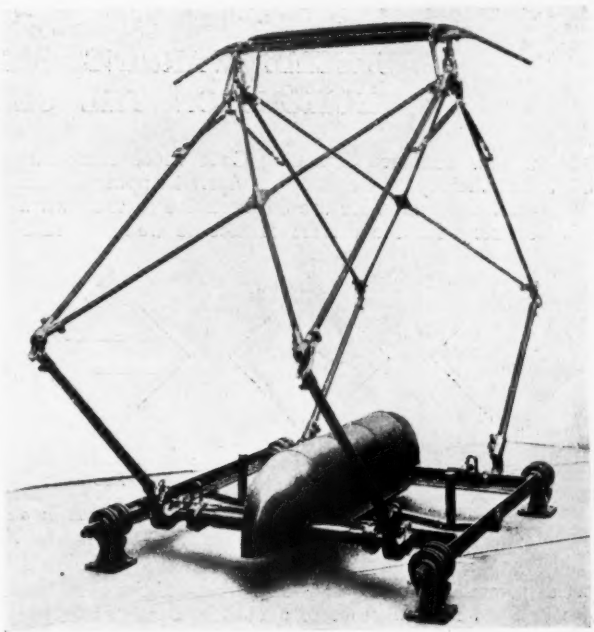
we have had the opportunity of travelling in the driver's compartment at this speed, and found the riding quite smooth.

Woods from the Belgian Congo have been used for the interior panelling of the cars, and the fittings generally are of chromium-plated bronze. The second class seats have small ledge tables between them. The heating and ventilating systems are integral, air being drawn in by a fan and passed along perforated aluminum-alloy ducts at the bottom of the side panels. In cold weather the air is passed over resistances fed directly by the 3,000-volt line current, and the heating is regulated by thermostat to a temperature of 18°-19° C. (64°-68° F.). All the windows of the second class compartments are of the drop type. Lighting is effected by two rows of lamps down the roof, and the lighting of each car can be operated independently at full or half strength. The sliding doors in the side panels are operated by compressed air on the Jaspar system, and are under the control of the driver for opening and under that of the guard for closing. The mechanical portions of the trains were built by the Ateliers de Nivelles and the Ateliers de La Dyle (Louvain). The electrical equipment for the former was built by A.C.E.C. and for the latter by S.E.M., but A.C.E.C. built all the pantographs and traction motor drives, and S.E.M. all the controllers. A certain amount of the electrical equipment was designed and built by A.C.E.C. in collaboration with the Ateliers de Secheron, of Geneva.

Electro-pneumatic semi-automatic control equipment is incorporated in the trains, and permits of the four motors of each coach being grouped in series, series-parallel, and series-parallel with shunted field. The two motors on each bogie are wound for 1,500 volts and coupled permanently in series. The traction motors have an hourly rating of 205 h.p. and transmit their torque to the wheels through the Secheron individual axle drive. The driving pinions and wheels are of nickel-chrome-molybdenum steel, the material of the wheels having an ultimate strength of 100 kg. per sq. mm. (64 tons per sq. in.) and that of the pinions 80 kg. per sq. mm. (50·5 tons per sq. in.) before casehardening. A dead-man handle is incorporated in the control and has a two-second delay before the current is shut off and the brakes applied.

The pantographs are of a light tubular design evolved by A.C.E.C. in conjunction with Secheron. The complete pantograph weighs about 9 cwt.; it is raised by springs and lowered by compressed air. The control and auxiliary services are supplied with low-tension current by a generator driven from the axle. Braking is effected on the Westinghouse system, and the air is furnished by two compressors driven by 3,000-volt 10 h.p. motors.

Automatic three-aspect colour-light signalling is used over the whole distance between Brussels and Antwerp. The contract was placed with the Belgian Westinghouse Company, but the apparatus was manufactured by A.C.E.C. at its Ruysbroek works, near Brussels. In connection with the re-arrangement of tracks at Brussels (Nord) consequent upon the electrification, a new electric signalling system has been installed at the terminus. The electric service is to consist of 67 trains a day in each direction, of which approximately half will make a one-minute stop at Malines. The non-stop time for the 44 km. (27·4 miles) between the termini will be 30 min., giving an average speed of 54·9 m.p.h.; the stopping trains are to have an overall schedule of 33 min. No main contractor was employed for the electrification, the work being carried out by the Belgian National Railways under the direction of the Chief Electrical Engineer, M. Em. Duquesne, whom we have to thank for facilities granted us.



Two of these pantographs are mounted on each motor-coach

New electric power signal box installed at the Nord station, Brussels, by the Ateliers de Constructions Electriques de Charleroi

SPECIAL WARNING SIGNS FOR ELECTRIFIED SECTIONS ON THE GERMAN STATE RAILWAY

IN the new Standard Signalling Code which came into force officially in Germany on April 1 appear several special signboards for use on electrified sections when it is necessary for the drivers of electric trains to take special precautions owing to the condition of the overhead wire or third rail, in order to avoid damage or, in some cases, delay. These new standard signs are illustrated on the accompanying diagram and are characterised by being painted blue, the distinguishing marks being white. Round the blue portion appear narrow black and white bands. The official designation number of each sign is given alongside it, and is taken from our contemporary the *Zeitschrift für das gesamte Eisenbahn-Sicherungswe en*, as given below. Fig. 1 contains the six principal signs, used as follows:—

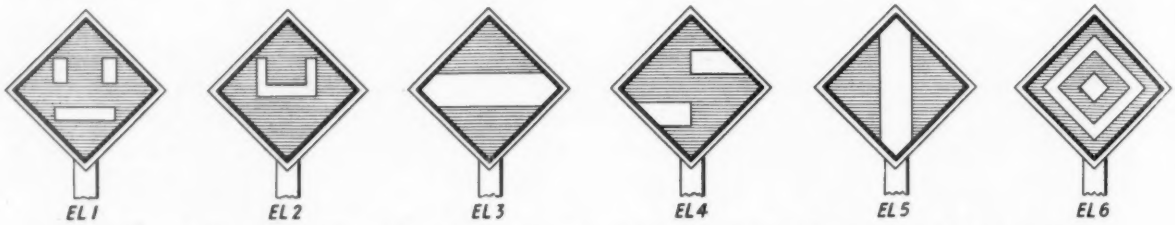


Fig. 1—Signs used for the signalling system on electrified sections of the German State Railway (Horizontal lines indicate blue)

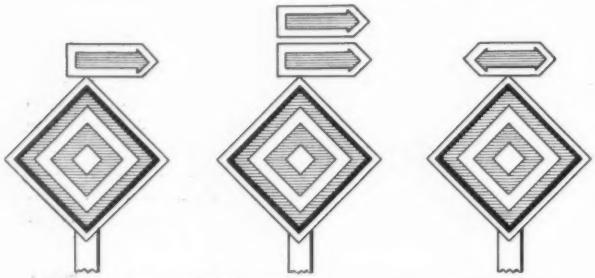


Fig. 2—Sign El 6 with supplementary arrow signs (Horizontal lines indicate blue)

Sign El 1: *Switch Off.*—Current must be switched off at latest on passing this sign.

Sign El 2: *Switch On.*—Current may be switched on again after passing this sign.

Sign El 3: *Lower the Pantograph.*—Current collectors on overhead wire sections must be lowered clear at latest on passing this sign.

Sign El. 4: *Prepare to Lower Pantograph.*—This is an approach sign indicating that Sign El 3 will shortly be met with.

Sign El 5: *Raise Pantograph.*—Current collectors may be raised again after this sign is passed.

Sign El 6: *Electrically-propelled Vehicles must not Pass this Point.*—This sign indicates a non-electrified section in which if the train stopped it would be unable to move again. It does not apply to battery-driven vehicles.

When shown in the simple form given in Fig. 1 the sign El 6 applies to the section of line beyond it on the track to the right of which it is placed. It is sometimes necessary to indicate more than this, according to the circumstances in different locations, and Fig. 2 gives examples of how arrow signs may be used to supplement it and show to which tracks of a group the principal sign refers.

The method of applying the signs is shown in Fig. 3, where on the left is seen an insulated dead section, inserted for safety reasons between two portions of conductor fed from different power stations. At the right-hand end of the loop is a defective piece of conductor protected by the collector down sign and its approach sign, while from the top line of the loop a siding diverges which is not electrified. The arrow above the non-equipped sign indicates that the track to the right is the one referred to. On single-line sections, as seen on the left of the figure, the signs El 2 appear to the left of the driver, being shown for convenience on the backs of the El 1 signs applying to the opposite direction, but except in these cases the usual practice of placing them on the right, in conformity with the principle of right hand running, is observed. One other sign, shown in Fig. 4, is also used at certain stations to indicate the point where electric trains must pull up when it is specially desired to do this. "H" (Halt) signs have long been used in Germany to mark the stopping point when the driver could not tell it from the ordinary signals in cases when some inconvenience might be caused by the train going further on, where it might, for example, interfere with the use of a luggage gangway across the lines. These signs still remain, the "H" on the blue ground being used only when an electric train must, for some reason, stop at a different place from a steam train. All the signs may, if desired, be lighted at night so as to appear the same as by day.

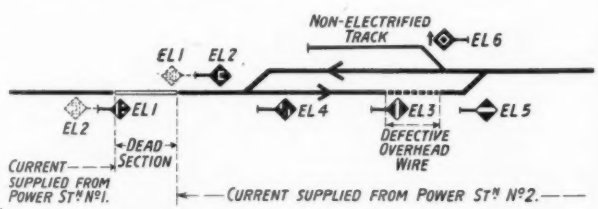
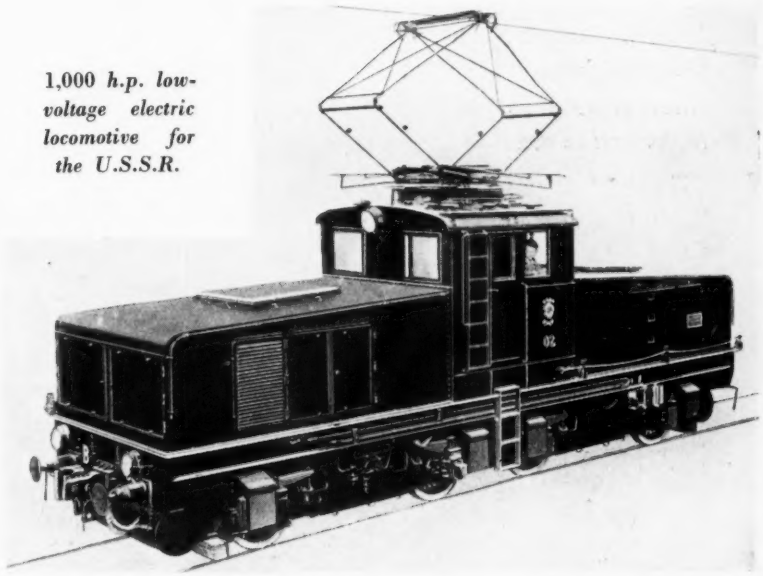


Fig. 3 (above) — Diagram showing the way in which the signs are used

Fig. 4 (right)—Special stop sign for electric trains (Horizontal lines indicate blue)

ITALIAN-BUILT ELECTRIC LOCOMOTIVES FOR RUSSIA

Russia is still obtaining large quantities of electrical equipment from abroad, and a Turin firm has recently completed the delivery of 26 locomotives



1,000 h.p. low-voltage electric locomotive for the U.S.S.R.

FOR the haulage at slow speeds of heavy coal and iron ore trains in the Urals and Siberia, the U.S.S.R. authorities have recently taken delivery of 26 electric locomotives for operation from 750-volt d.c. overhead lines. The railways over which these locomotives will run are actually feeders from the mines to the main lines, and it was largely for this reason, and through the difficulties attending the operation of high-tension systems in works and yards, that the standard Russian 1,500 and 3,000-volt. d.c. equipment was not used. The locomotives were designed and built by the Officine di Savigliano, of Turin, and they run on the standard Russian gauge of 5 ft. Trains of 700 tons weight can be hauled up grades of 1 in 33, but despite the prevalence of heavy gradients, only two of the locomotives have been equipped for regeneration.

The locomotives are of the double-bogie type with a steeple cab containing two complete sets of controls. The four nose-suspended traction motors each have an hourly capacity of 250 h.p. with a corresponding tractive effort of 3,400 kg. (7,500 lb.) at a speed of 19 km.p.h. (11·8 m.p.h.). On the continuous rating the corresponding figures are 200 h.p., 2,550 kg. (5,625 lb.), and 20·5 km.p.h. (12·4 m.p.h.). The locomotive thus has respective total tractive efforts of 13,600 kg. (30,000 lb.), and 10,200 kg. (22,500 lb.) at the hourly and continuous ratings. The motors are force-ventilated, and may be connected in series, series-parallel, or parallel, an unusual provision in a locomotive for such slow speeds. The control is on the electro-magnetic system, and the contactors are fed directly from the overhead line. The resistances are housed in the bonnet at one end and the auxiliary apparatus in the other.

A point of interest in the design of the mechanical portion which can be seen in the accompanying drawing is the low position of the bogie pivot. The complete underframe, and a good deal of the bogie and superstructure are fabricated by electric welding. Willison automatic centre couplers are fitted, and the locomotive is braked on the Westinghouse compressed air system.

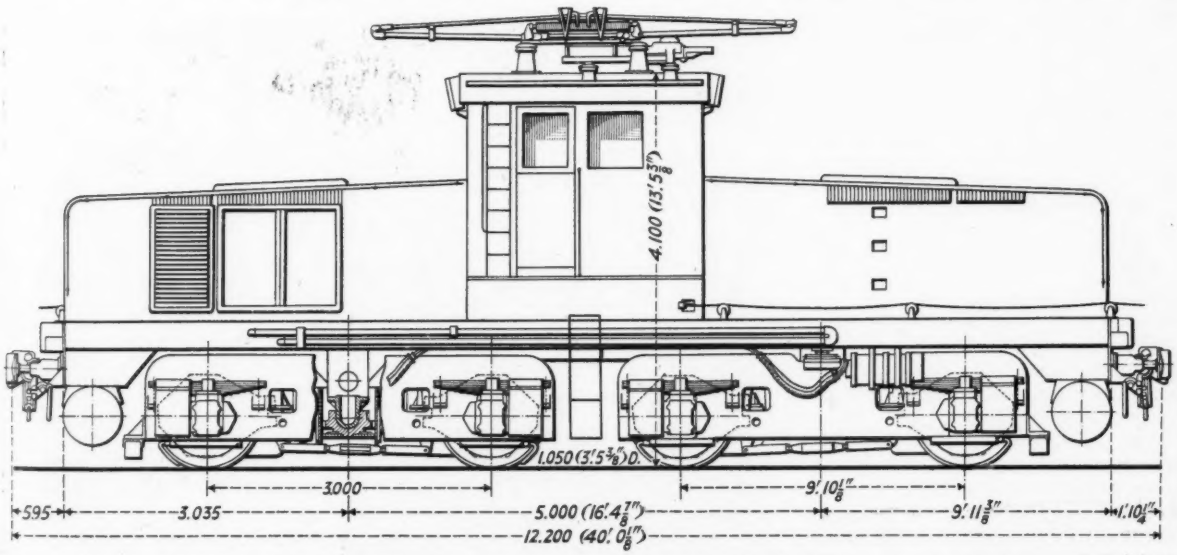
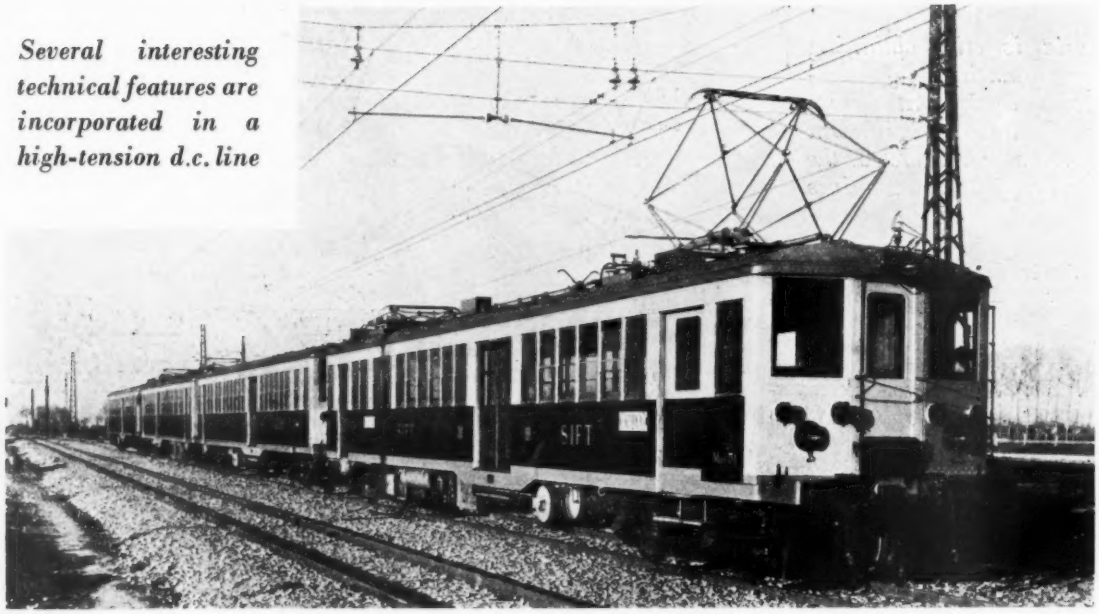


Diagram of Bo-Bo 1,000 h.p. electric locomotive for a 750-volt d.c. line in the Urals

NEW STANDARD-GAUGE ITALIAN ELECTRIC RAILWAY

Several interesting technical features are incorporated in a high-tension d.c. line



3,000-volt d.c. electric train on the Piacenza-Bettola Railway

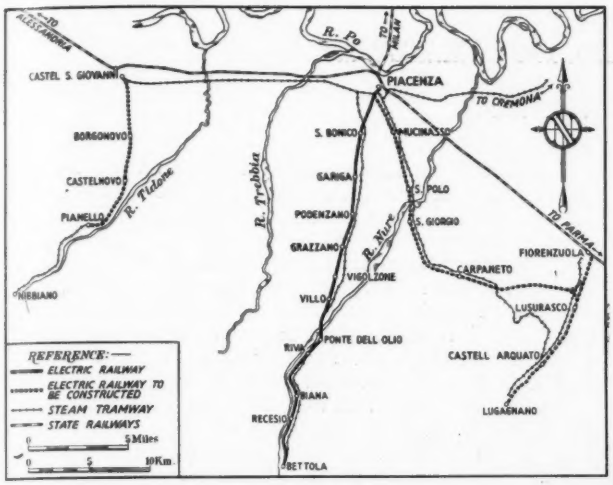
ALTHOUGH electrifications of steam-worked lines are quite common, a new line specially laid out for electric traction is more of a rarity. One of the latest examples of this class is the Piacenza-Bettola line in Italy, which is operated on the 3,000-volt d.c. system. Projected by Sr. Marco Semenza, this line is located south of Milan, and has a route mileage of 20. The whole line is single track and has occasional gradients as steep as 1 in 50; the curves are no sharper than 20 chains radius, and most of the line is quite straight.

Further lines from Lusurasco to Fiorenzuola and from Castel S. Giovanni to Pianello (as shown on the accompanying map) are contemplated, and when built will take their power supply from the grid in the province of Piacenza, which feeds the single substation of the Piacenza-Bettola section. This substation is located at Ponte dell'Olio, and is equipped with two 1,340 kVA. oil-cooled transformers, and two mercury arc rectifiers having a rated capacity of 1,000 kW.; one of these units is held as a reserve, but each set is used as the power group on alternate days. The substation auxiliaries include a 180 amp.-hr. battery which is charged by a glass bulb rectifier, and a filter circuit to eliminate the harmonics of the rectified current and thus prevent interference with the telephone lines.

From the rectifiers the 3,000-volt direct current is fed to the overhead system, which is of the single catenary type with a copper contact wire and a high-tensile steel catenary. The latter consists of 19 stranded wires of 1·82 mm. diameter which have an ultimate strength before stranding of 76-89 tons per sq. in. By the use of this material it has been found possible to reduce the sag over the 90 m. (295 ft.) spans which are used on the straight sections. The tensioning devices for the contact wire are spaced at intervals of 1,000 m. (3,280 ft.), and maintain a constant pull of 800 kg. (1,760 lb.). The masts for the overhead systems are of all-welded lattice construction as shown in the illustration on the next page. They are anchored in concrete foundations, and carry the telephone and signalling circuit wires in addition to the catenary system.

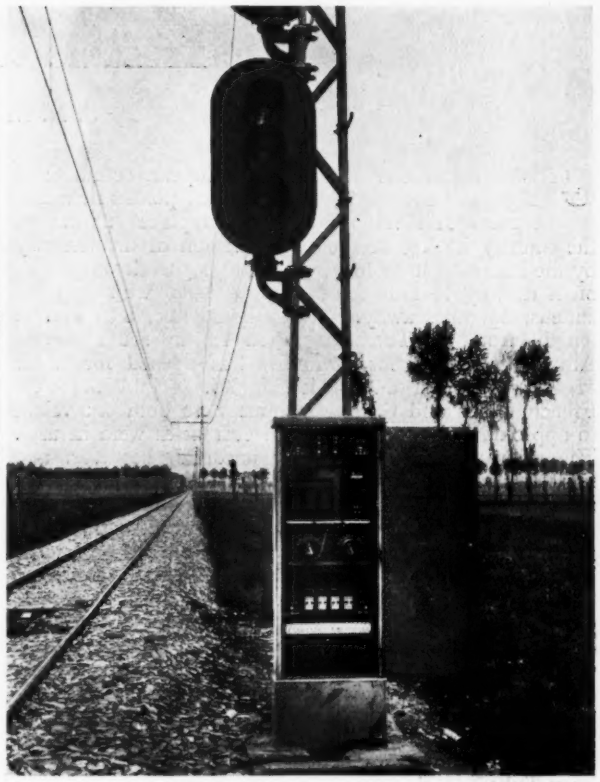
All-metal rolling stock with first and third class accom-

Ponte dell' Olio substation with two 1,000 kW. rectifiers

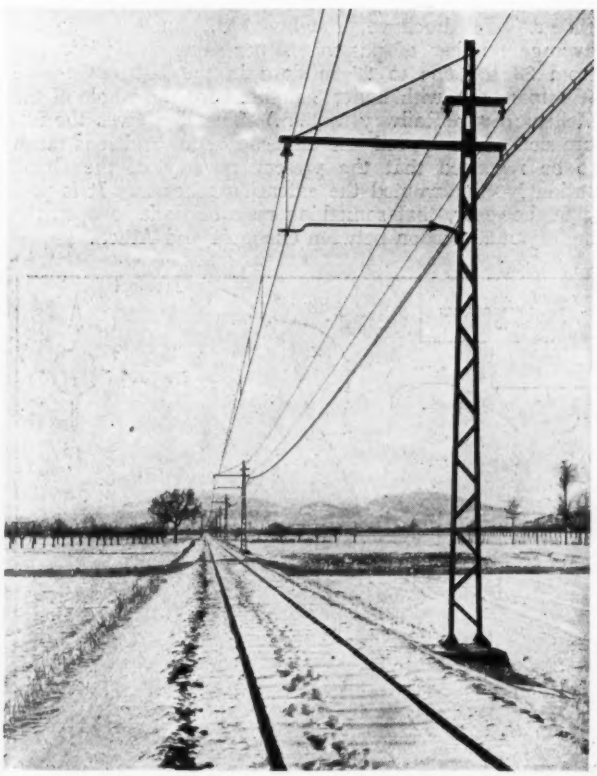


Map of Piacenza-Bettola Railway

modation is used, and the trains at rush hours are made up of two motor coaches and two trailers. Each car has a seating capacity of 16 first class and 56 third class. The bogie frame structures of both motor coaches and trailers are cast in one piece and the 36-in. wheels are braked on the vacuum system. Four self-ventilated 1,500-volt. d.c. traction motors are fitted to each motor coach, and transmit their torque to the wheels through a form of quill drive. Current is collected by two single-pan pantographs which are raised by springs and lowered by compressed air. The control gear is of the automatic electro-pneumatic type arranged for multiple-unit operation. All the main switch gear is located beneath the floor of the car and no high-tension compartment is provided. The motor for the auxiliary apparatus is wound for a tension of 3,000 volts, and is fed directly from the line.



Automatic three-aspect colour-light signal



3,000-*volt d.c. overhead construction*

Signalling

The running of the trains is controlled by automatic colour-light signals on the Ericsson absolute-permissive (A.P.B.) system. The line between passing loops is divided into two block sections by means of intermediate signals placed mid-way. This allows of two trains being run in the same direction at one time, but prevents opposing trains being on the single line together. The space between the starting and home signals at each loop also constitutes a block section. These signals show red and green aspects and the intermediate signals show red, yellow and green. There is also a violet aspect in the starting signals, which is lighted when the signal cabin is open and shunting has to take place. The normal indication of all signals is " proceed." The line is completely track circuited, single rail circuits being used at the loops with a.c. vane relays. The longer track circuits are double rail with impedance bonds and have d.c. relays fed through rectifiers. Some of the loops are halts where there is no official on duty. There the guard has to operate the signals and points for shunting, and carries a special key with which to unlock the apparatus. At the other loops the stationmaster has charge of the working. In each case there is a small all-electric frame for the signals and a mechanical one for the points, which are worked on the double wire system. There is also the usual illuminated diagram. A selective telephone system has been installed to connect the stations and other points of importance, such as level crossings, with each other and with the train despatcher.

XUM

THE HELLENIC ELECTRIC RAILWAY

By S. H. BEAVER, M.A.

GREECE was one of the last European countries to begin the construction of railways, political circumstances and the difficult topographical nature of the country having delayed the invasion of the territory by the iron road until 1867. In that year work was begun on a railway to link the capital, Athens, with its port, Piræus, 5½ miles away. The original line, 8·65 km. in length, from the Theseum station on the south side of Athens to the Piræus terminus, was opened for traffic in 1869. It cost 5·7 million francs. (Until the war, French francs and Greek drachmæ were both equivalent to approximately 10d., and both currencies were in use). The railway proved financially unsound, however, and in 1874 the concern was bankrupt. Its fortunes revived after the reorganisation of the company in 1880, and in 1884 the first extension of the line was built—an underground section 1½ km. in length from the previous Theseum terminus to Omonoia, the *Place de la Concorde*, in the heart of the city of Athens. In 1904 the line was electrified.

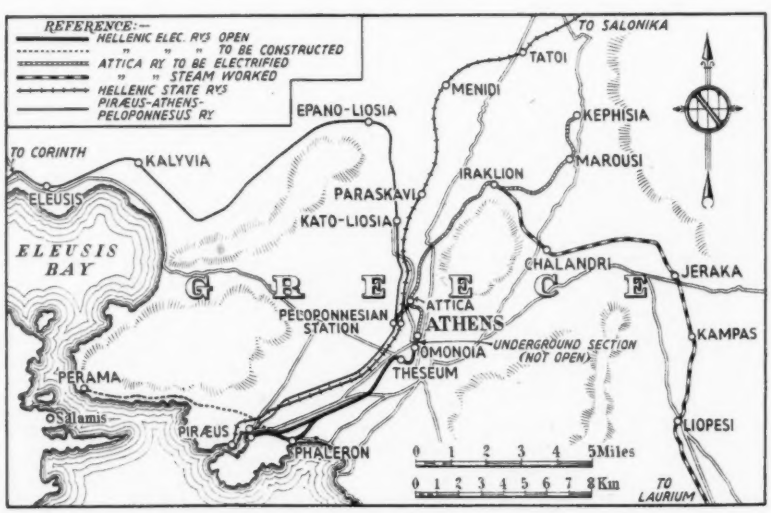
The war hit Greece exceptionally hard, and the burden of having to support two million refugees from the former Greek settlements in Asia Minor did not stimulate the flow of capital into new enterprises. Nevertheless much has been done in post-war years to improve the transport amenities of the country. The State Railway system has been linked to that of the remainder of the Continent, and through communication is now possible from Paris and Berlin to Athens.

In 1926 the Omonoia station was reconstructed, and a further underground extension, undertaken by a German firm, was completed from Omonoia to the Attica station on the north side of the city, the terminus of the Attica Railway which runs to Kephisia and through the Attica peninsula to Laurium. This new tunnel is 3 km. in length. The track is laid, but the connection with the steam lines at the Attica end has not been completed, and the entrance to the tunnel is barred by massive gates. It is proposed eventually to continue the electrification to Kephisia, 11 km., a popular residential town at the foot of Mount Pentelicon, where many of the wealthier Athenians prefer to live outside the heat and noise of the city. The Hellenic Electric Railway embarked in 1926 upon an elaborate programme of improvements and extensions; the economic depression of 1930-33 delayed the commencement of practical work, but it was recently announced that the first step of doubling and electrifying the line of the Attica Railway from Athens to Kephisia was to be put in hand.

Another extension is now under construction from Piræus to Perama, at the end of the peninsula which overlooks the sheltered waters between the mainland and the island of Salamis, where the Greek navy has its headquarters and arsenal. This line will also provide a link with the State Railway system at Piræus, and should thus prove of some strategic value. The total length of electrified line when all these proposed extensions are completed will be 34 km.

The track is standard gauge, and the third-rail system of 600-volt direct current distribution is used. The trains are run on the multiple-unit system, each train having six coaches. The original coaches were of Belgian construction; others have since been erected at the company's works at Piræus. They somewhat resemble some of the Paris Metro stock in appearance, the sides being match-boarded and varnished, and the interior giving abundant room for standing passengers as well as seats. Each vehicle is capable of carrying 100 passengers, and there are only two classes, first and third. A maximum speed of 40 m.p.h. can be attained, and the journey from Omonoia to Piræus takes 17 min. with five intermediate stops. The Siemens automatic block system of signalling is employed, and both semaphore and coloured-light signals are in use; trains are braked automatically should a signal be overrun. A six or seven minute service is maintained for most of the day, though the equipment is capable of working trains at 3½-minute intervals. This contrasts with most of the railways in Greece, where a dozen trains a day would represent traffic of phenomenal intensity.

Although a fair amount of goods transport is done between the port and the city—especially of perishable goods such as fish and fruit—it is the passenger traffic which yields the bulk of the revenue, and the authorities are naturally much concerned at the reduction within the last year or two since an intensive omnibus competition has arisen. The fares are very cheap, like most things in Greece—single fare third class from Omonoia to Piræus is 4 drachmæ, roughly 1¾d., but even so the average number of passengers per annum has dropped from 33 millions to 24 millions in the last few years. (Compare this with under 3 millions for the whole of the Hellenic State Railway system.) The line gives the impression of being well and efficiently run, and it is much to be regretted that the present poverty of the Greek nation has interrupted the extension schemes. It is possible, however, that something may be done to open the underground section between Omonoia and Attica.



Map of the railways in the neighbourhood of Athens

BUENOS AIRES UNDERGROUND

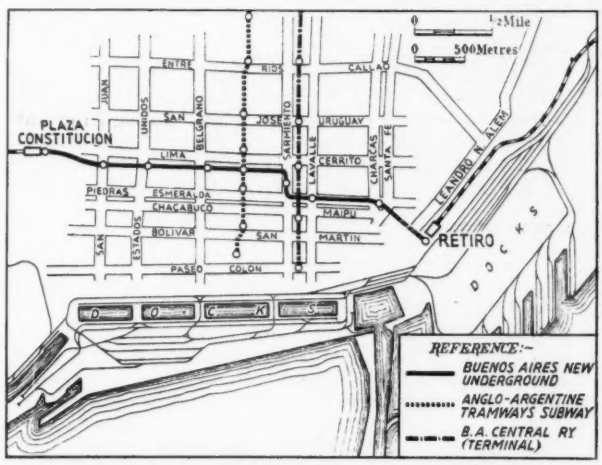
Third subway in the Argentine capital has recently been completed

TWO underground lines have been operating in Buenos Aires for some time, viz. the Anglo-Argentine Tramway Co.'s line, 4½ miles long, and the Buenos Aires Central Terminal Railway, 5 miles long. Both of these systems run due west from the docks, but the first portion of a third line has just been completed which runs south from the Retiro terminus of the Central Argentine Railway to the Plaza Constitucion terminus of the Buenos Ayres Great Southern Railway, 2¾ miles.

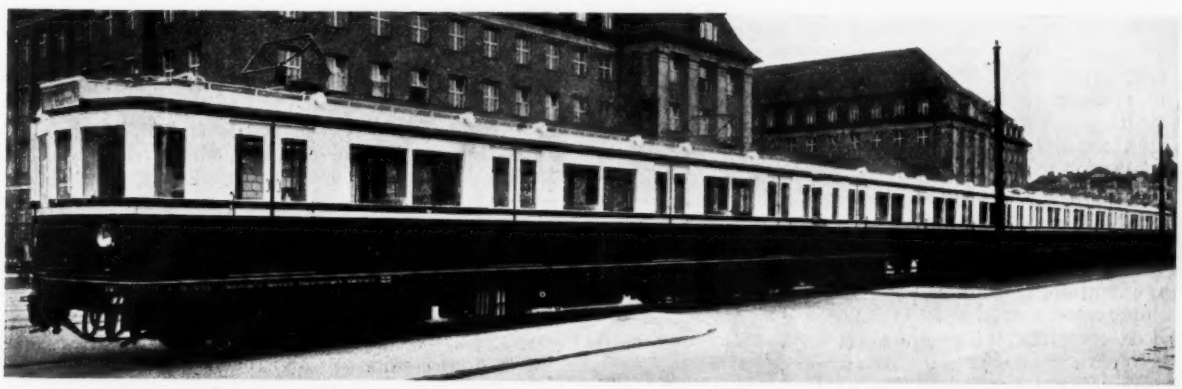
Interior of one of the new Buenos Aires underground cars which have overhead current collectors

The new line belongs to a Spanish organisation, the Comp. Hispano Argentina de Obras Publicas y Finanzas, but all the constructional work and rolling stock construction has been done by German companies. The first portion of the line was opened on November 9, but the service has since been suspended by a decree of the City Council, which considers that the line has been opened with undue haste and that there is a lack of efficient direction and organisation. The whole subway is to be re-inspected by the technical officials of the municipality. Excavation over the last part of the line from Sarmiento to Retiro is now proceeding, but the work will not be completed until October, 1935.

This subway is unusual among underground electric railways in that overhead contact wires are used instead of the third rail; the line current is at a tension of 1,500 volts. The trains are to be run as two-car units during the day and as four-car sets in the rush hours; they were built by Siemens-Schuckert with Orenstein & Koppel A.G. as sub-contractor for the mechanical portions. Both the motor coaches and trailers are 57 ft. 6 in. long, and have 35½-in. wheels spread over a bogie wheelbase of 7 ft. 3 in. The motor-coaches have seating accommodation for 40 passengers and the trailers for 42, but each car has a standing capacity of over 100. Four nose-suspended 154 h.p. motors are mounted on each motor coach and can give an acceleration of 2·35 ft. per sec. per sec. A two-coach train tares 53 tons.



Map showing underground lines in Buenos Aires



Four-car train for the new Buenos Aires Underground outside the works of the builders, Siemens-Schuckert

NEW ELECTRIC LOCOMOTIVE DRIVE

A NEW system of individual axle drive for electric locomotives has been invented and patented by the British Thomson-Houston Co. Ltd. It consists of an arrangement whereby the torque from the motor shaft is transmitted to the wheels by means of links, some or all of which are flexibly constructed and are provided with ball or roller bearings at their points of articulation. On the wheel 2 usually fixed to the axle 1 are fixed two journals 3 which carry the inner rings of roller bearings 4, the outer rings of which are carried by the heads of simple links 5. Two shafts 6 passing through the forked ends 7 of a plate 8 receive the inner rings of another bearing. The plate 8 is kept parallel with the wheel by means of flanged guides 9 which project through slots in the plate and are mounted on the wheel. The slots are of such a size that the plate 8 can move to a limited extent provided it remains parallel with the wheel 2. A transmitting member driven by the motor shaft carries two journals 10 supporting the inner rings of the bearings 11. Openings 12 are provided in the wheel for the passage and fitting of the journals 11. A complete link illustrated more in detail in Fig. 2 mounted on the cardan shaft at each of its extremities is made up as follows: two members 13 with journals receive in the centre the outer rings of the bearings 11—11¹ and on each of their journals the inner rings of bearings 14. These heads are rigidly connected together by four steel blades 16 of rectangular section. Two shafts 17 receive the inner rings of the bearings 11¹ and connect these links to the forks 7 of the plate 8. If the wheel, placed with its axis AB horizontal, ascends or descends, its journals 3 act, through the links 5, to move the plate 8 and the shafts 17 of the cardan links. The latter tip to the extent required by pivoting on the bearings 11¹ and about the shafts 17. If on the contrary the axis AB is vertical, the journals 3 ascend or descend and the links 5 tip by pivoting on the bearings 4 and about the shafts 6. If the axis AB is placed in an intermediate position, these two movements are combined. When the wheel is displaced in the longitudinal direction of the axle, it carries with it the plate 8 and, as the members 13 dependent on the transmitting member have not moved, the composite links 15, 16 tip by pivoting on their bearings 14.

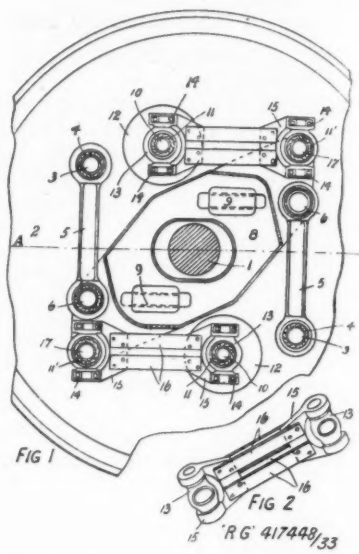


Diagram of the new British Thomson-Houston system of individual axle drive for electric locomotives

Electrification News

Glasgow Subway.—In connection with the electrification of the Glasgow Subway, Lt.-Col. A. H. L. Mount and Col. A. H. Trench, of the Ministry of Transport, made a final inspection of the electrified inner track on Tuesday, March 26, and the public service began on March 28. It is stated that some months must elapse before the outer track is passed for traffic. An article on the Glasgow Subway electrification was published in the issue of this Supplement for December 14, 1934.

Roumanian Electrification.—Growing traffic, and the cost of steam traction were together responsible for the decision to electrify the Campina-Brasov line, which comprises severe gradients and carries heavy traffic. It is estimated that the new scheme will effect an annual economy of about 85,000,000 lei (£175,000 approximately) in running expenses alone, as compared with those of steam working, which total about 170,000,000 lei (£350,000 approximately) a year. It is estimated that the cost of conversion will be about 520,000,000 lei (£1,100,000).

Sale of Naples-Baiano Railway.—The Societa Strade Ferrate Secondarie Meridionali (Southern Secondary Railways), which maintains the Circumvesuviana service round Vesuvius, has recently purchased the Naples-Nola-Baiano line, and already plans for the electrification and improvement of the 38 km. (23·6 miles) of track have been completed. The approach to Naples is also to be reconstructed at a cost of about £165,000. Another proposal is to double the track line within the city of Naples, and the Municipality of Naples will contribute a fourth of the total £150,000 needed.

Publications Received

B.I. Thiokol and Hard Drawn Copper.—British Insulated Cables Limited, of Prescot, has issued two pamphlets, one dealing with their Thiokol brand sheathing for rubber insulated cables and wires, and the other describing their hard drawn copper solid and strand circular conductors for overhead power lines. The brochures are numbered P.F. 173 and P.F. 171, respectively.

Copenhagen Suburban Electrified Lines.—The electrification of the above system is described in a well-illustrated brochure to hand from the English Electric Co. Ltd., of Queen's House, Kingsway, London, W.C.2. Much interesting information on oil circuit-breakers fitted with the de-ionising method of arc control is given in a further brochure numbered R. 35.

Electrical Year Book, 1935. London: 28, Bedford Street, W.C.2. Manchester: "Mechanical World" Office, 31, King Street West. 6¼ in. × 4¼ in. 371 pp. Price 1s. 6d. net.—A feature of this volume, in contrast to many annual pocket books, is that it has a distinct use for those engaged in railway work, by reason of the comprehensive section on electric traction. Tables showing the route mileage of electrified steam railways in various countries are given, but these have not been brought up to date since last year, despite the several big schemes which have been completed during the year. A chapter on mercury arc rectifiers has been included for the first time, but in future editions we would like to see some mention made of rectifier substations in the electric traction section, for the rectifier is one of the greatest single improvements which has ever been applied to railway electrification.